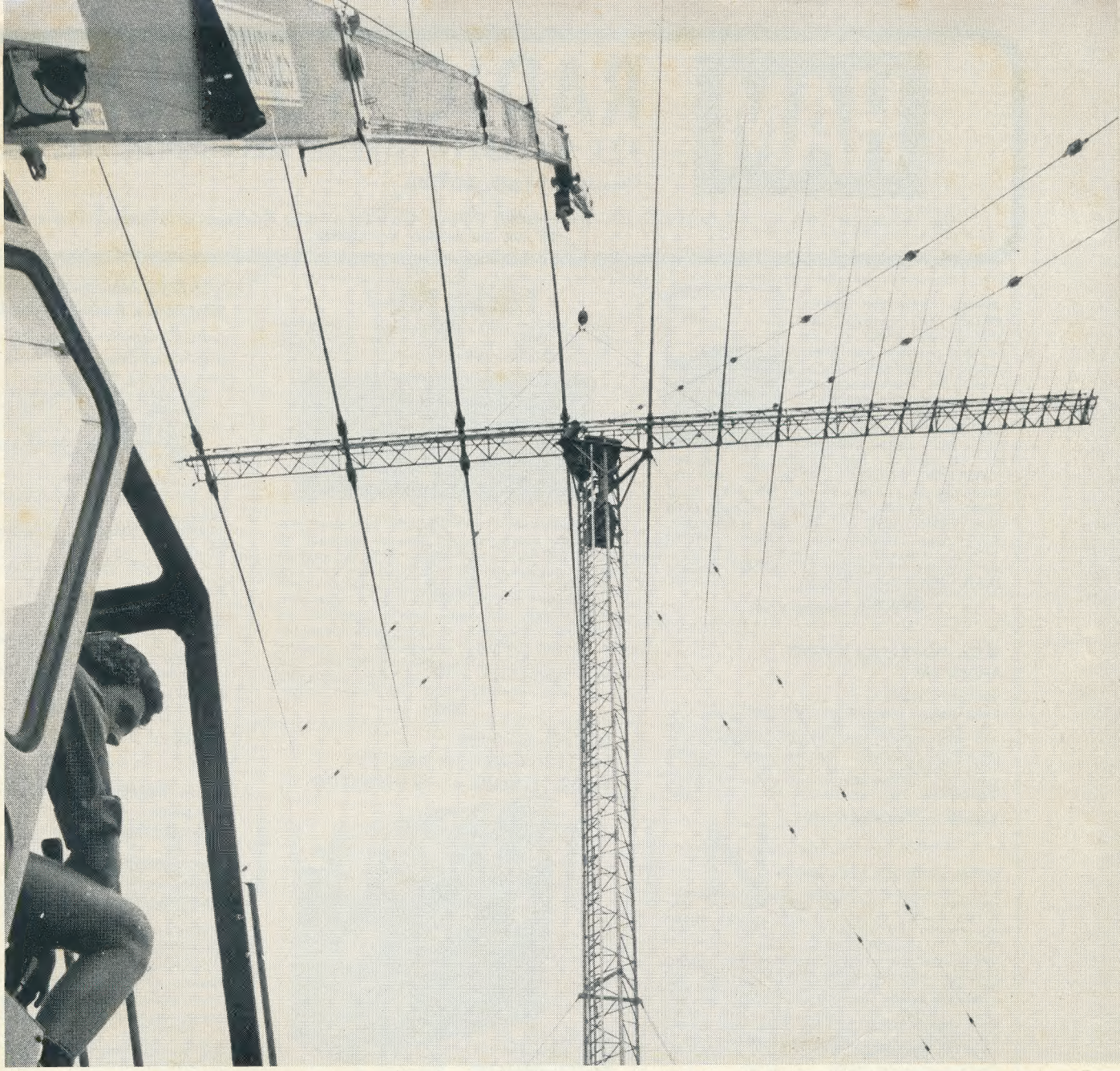
amateur radio



VOL. 45, No. 8 AUGUST 1977

CONTENTS

TECHNICAL

Antenna Measurements 10
Finding Oscar with your Pocket Calculator 16
Modifications to the Yaesu FT220 Transceiver 20
Operators Eye-View of the HW7 and QRP Operation 23
Radio Teletype—Pt. 8 (conclusion) 7
Try This 17
1976 Total Solar Eclipse 20

GENERAL

Citizens Band Freq. Allocations 9
How to Win RD and/or similar Contests 26
Rua Hama 17
The Man Behind the Microphone 9
Victorian Novice Amateur Examination—1977 6
WIA Correspondence—Stop Press 6

DEPARTMENTS

ATV News 28
Awards Column 29
Contests 29
Hamads 33
IARU News 28
Intruder Watch 28
Ionospheric Predictions 31
LARA 29
Letters to the Editor 33
Magazine Index 29
Project Australis 33
QSP 3, 6, 9, 31
Silent Keys 34
VHF-UHF—an Expanding World 27
WIANEWS 5

COVER PHOTO

Is this the antenna you have always wanted? If so, you will need a big back yard or very agreeable neighbours. The 19 element log periodic array is one of two erected recently at the Army's radio receiving station at the Greenbank camp, on Brisbane's southern outskirts. The elements are mounted on a 22m boom. The distance between tips of the longest elements is 24.3m. Two cranes were used to erect two 30.4m towers. The work was done by the antenna construction troop of the 127th Signal Squadron, based at Ivanhoe, Melbourne. If you want this antenna, the cost of the Australian designed unit complete is $36,000. And these are for receiving only.

Photo by Queensland Newspapers Pty. Ltd.

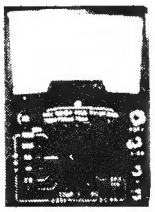
JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA

HAM RADIO SUPPLIERS

323 ELIZABETH STREET, MELBOURNE, VIC., 3000

Phones: 67-7329, 67-4286

Our Disposals Store at 104 HIGHETT ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 9.00 a.m. to 5.00 p.m., and on Saturdays to midday.



MODEL OL64 D/P MULTIMETER. Very ruggedly constructed this model is particularly suitable for workshops. It features special scales for measurement of capacitance and inductance. Diode protested movement: **Specifications:** 20,000 ohm/volt DC. 8,000 ohm/volt AC. DC volts — 0.25; 1; 2.5V; 10; 50; 250; 1,000; 5,000. AC volts — 10; 50; 250; 1,000. DC amps: 50 uA; 1 mA; 50 mA; 500 mA; 10 A. Ohms — 4 K ohm; 400 K ohm; 4 M ohm; 40 M ohm. Centre scale — 40 ohm; 4,000 ohm; 40,000 ohm; 400,000 ohm. Decibel: —20 to +62 dB, Dimensions: 6" x 4-1/5" x 2"; 152 x 107 x 51 mm. Inductance — 0/5000H. Carrying case available, Model C $6.90.

$29.90 **Postage $2.20**

E.E.I. PORTABLE RADIO

AM/AIR VHF

SPECIFICATIONS:

Freq. Range: AM530-1600 kHz, AIR (VHF) 108-174 MHz. **Intermed. Freq.:** AM 465 kHz, FM 10.7 MHz. **Output:** 450 mW max. **Speaker:** 2½" permanent—magnetic dynamic type, 8 ohm. **Power Source:** DC — 6V (4 x UM3 Penlite) or equivalent. **Semiconductor:** 10 trans., 7 diode. **Dimensions:** 8½" (W) x 4½" (H) x 1-7/8" (D)

$18.90 — Postage $1.40

MODEL AS100 D/P MULTIMETER

This meter features double zener diode meter protection and 3½" full view easy to read 2 colour scale. It is fitted with polarity reversing switch and housed in a strong moulded case with carrying handle.

SPECIFICATION: 1000,000 ohm/volt DC. 10,0000 ohm/volt AC. **DC Volts:** 0.3, 3, 12, 60, 120, 300, 600, 1,200. **AC Volts:** 6, 30, 120, 300, 600, 1,200. **DC Amps:** 12 uA, 6 mA, 60 mA, 300 mA, 12A. **Ohms:** 2k, 200k, 2m, 20m, 200m ohm. **Centre Scale:** 20 ohm, 2,000 ohm, 20,000 ohm, 200,000 ohm, 20m ohm. **Decibel** —20 to +57 db. **Dimensions:** 7-3/5 x 5-2/5 x 2-3/5 ins.

Carrying case for model I — $7.90.

Price: $52.50 — Postage $2.20.

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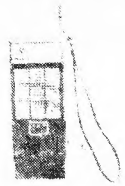

- **WITH CALL SYSTEM**
- **EXTERNAL AERIAL CONNECTION**

SPECIFICATIONS, NC-310

Transistors: 13.
Channel Number: 3, 27.24 OMHz Citz. Band.
Transmitter Frequency Tolerance: ± 0.005%.
RF Input Power: 1 Watt.
Tone Call Frequency: 2000 Hz.
Receiver type: Superheterodyne.
Receiver Sensitivity: 0.7 uV at 10 dB S/N.
Selectivity: 45 dB at ± 10 kHz.
IF Frequency: 455 kHz.
Audio Output: 500 mW to External Speaker Jack.
Power Supply: 8 UM-3 (penlite battery).
Current Drain: Transmitter: 120-220 mA.
Receiver: 20-130 mA.

Price: $105.00 — Postage $1.40

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THE RADIO FOR WORLD-WIDE LISTENING AT ITS BEST — 0.5-29.9 MHz COVERAGE SYNTHESIZED COMMUNICATION RECEIVER

The model FRG-7 is a precision built high performance communication receiver designed to cover the band from 0.5-29.9 MHz. Its state of the art technology offers an unprecedented level of versatility. The Wadley Loop System (drift cancellation circuit) coupled with a triple conversion super heterodyne system guarantees an extremely high sensitivity and excellent stability. It provides complete satisfaction to amateurs as well as BCLs with superb performance and many features such as RF attenuator, selectable tone, and automatic noise suppression circuit.

$328

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AM, SW, FM, VHF, AIR, PB
BATTERY-OPERATED
COLOUR CODED 9 BAND DIAL

1. AM 535 to 1600 kHz. 2. Marine 1-5 to 4 MHz. 3 & 4. Combined SW 4 to 12 MHz. 5. 30 to 50 MHz. 6. 88 to 108 MHz. 7, 8 & 9. Combined VHF Aircraft 145 MHz-174 MHz incorporating weather band.

Slider control, Dial light, Fine tuning control, Flip-up Time Zone map, Telescope antennas complete with batteries.

SPECIAL PRICE **$65** Post Pack $3.00

MULTI-BAND RADIO

SPECIFICATIONS:

Circuit: 16 Transistors, 15 Diodes, 1 Varistor and 2 Rectifiers.
Frequency Range: AM 535-1605 kHz, FM 88-108 MHz, TVI 56-108 MHz, TV2 174-217 MHz, AIR/PB2 110-174 MHz and WB 162.5 MHz.
Power Source: AC 240 Volts 60 Hz 4 Watts, DC 6 Volts.
Power Output: 350 mW (max.) 250 mW (undist.)
Dimension: 9⅜" x 3¾" x 8".
Weight: 4¼ lb. (approx.)
Supplied Accessories: Earphone, Batteries (4 size D).

$49.00 — Postage $2.50

HANIMEX AM/CB/FM SOLID STATE PORTABLE RADIO Model 2818

OWNER'S GUIDE — Operating Instructions.

SPECIFICATIONS:

Semiconductor Complement:
22 Solid State Devices (11 transistors, 11 diodes).

Frequency Range:
AM540-1600 kHz, CB channel 1-40, FM 88-108 MHz.

Intermediate Frequency:
AM/CB 455 kHz, FM 10.7 MHz.

Output Power:
300 mW Maximum, 10% Distortion 200 mW.

Speaker:
3" 8 ohm Dynamic.

Power Source:
Battery 6V "A-A" size.

Antenna:
AM Ferrite Bar Antenna, CB/FM Rod Ant.

Dimensions:
7" Height x 3.5" Width x 1⅞" Depth.

Weight:
1 lb. (without Battery).

$27.90 — Postage $1.50

E.E.I. SOLID STATE CAR RADIO

MW BAND
PUSH-BUTTON TUNING

SPECIFICATIONS:

Power Supply: 12 V DC
Receiving Frequency: MW 520KC (580M) — 1640KC (183M)
Intermediate Frequency: 455KC
Audio Output: 4.5W
Transistors: 8, diode 4
Speaker: 5" Permanent Dynamic 4 ohm
Sensitivity: Less than 20 uV at 20 N/S
Selectivity: More than 25 dB at ± 10 kHz detuning
A.G.C.: More than 45 dB at 1,000 kHz
IF Rejection: More than 40 dB at 600 kHz
IM Rejection: More than 50 dB at 1,400 kHz
Cabinet Dimension: 1-7/8" (H) x 6-1/5" (W) 4-1/8" (D)

$35.90 — Free Post

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a truly portable communications receiver, based on the WADLEY LOOP principle, the same principle as applied in the DELTAHET and RACAL receivers. A truly crystal-controlled highly sensitive multiple-heterodyne portable receiver of exceptional stability with continuous, uninterrupted coverage from 500 kHz to 31MHz.

All for **$310.00** F.O.R.

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amateur radio

Published monthly as its official journal by the Wireless Institute of Australia, founded 1910.

AUGUST 1977
Vol. 45, No. 8

PRICE: 90 CENTS
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The Editor reserves the right to edit all material, including Letters to the Editor and Hamads, and reserves the right to refuse acceptance of any material, without specifying any reason.

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Tel.: 41-5054, 41-5055

QSP — 1977 CALL BOOK

The 1977 WIA Australian Radio Amateur Call Book is the first of a long series to utilise computer data.

This is the culmination of many years of investigation into the practicability of the scheme.

It was not until the readout from the computer could be produced in a form of sufficient quality to be acceptable for printing that the go-ahead could be given.

It was agreed with the P and T Department that our WIA membership lists could be used to produce the addresses.

In the case of non-members, the listings provided by the Department have been fed into the computer.

A number of apparent anomalies immediately showed up, and steps have been taken to eliminate them as far as possible.

However, we are confident that our own records are as accurate as the members themselves will let them be, because no one wants to miss AR.

We cannot be as confident with those of the non-members.

In conclusion, it must be emphasised that now the total amateur call sign listing is on the computer file, it will be much easier to maintain accuracy, given time to eliminate the quirks.

D. A. WARDLAW VK3ADW,
Federal President. ■

WIRELESS INSTITUTE OF AUSTRALIA

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Executive Office: P.O. Box 150, Toorak, Vic., 3142. 2/517 Toorak Rd, Toorak, Ph. (03) 24 8652.

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ACT:
President — Mr. S. W. Grimsley VK1VK
Secretary — Mr. D. J. Farquharson VK1ZDF
Broadcasts— 3570 kHz & 146.5 MHz: 10.00Z.

NSW:
President — Mr. T. I. Mills VK2ZTM
Secretary — Mr. I. A. Mackenzie VK2ZIM
Broadcasts— 1825, 3595, 7146 kHz, 28.5, 52.1, 52.525, 144.1, Ch. 8 and other relay stations: 01.00Z. (Also Sunday evenings 09.30Z and Hunter Branch, Mondays 09.30Z on 3570 kHz and ch. 3 and 6).

VIC.:
President — Mr. A. D. Kerr, VK3JQ (Acting)
Secretary — Mr. J. A. Adcock VK3ACA
Broadcasts— 1825, 3600, 7135 kHz — also on 6m, 2m SSB and 2m Ch. 2 repeater: 00.30Z (Also on Radio 3CR Mondays 10.15 and 3HA).

QLD.:
President — Mr. D. T. Laurie VK4DT
Secretary — Mr. P. Brown VK4PJ.
Broadcasts— 1825, 3580, 7146, 14342 kHz: 0.900 EST.

SA:
President — Mr. C. J. Hurst VK5HI
Secretary — Mr. C. M. Pearson VK5PE
Broadcasts— 1815, 3550, 7125, 14175 kHz, 146.5, 145.7, 146.8 (ch. 4), 431.965 6m and 2m (Ch. 8): 09.00 SAT.

WA:
President — Mr. R. Greenaway VK6DA
Secretary — Mr. N. R. Penfold VK6NE
Broadcasts— 3600, 7080, 14100, 14175 kHz, 52.656 and 2m (Ch. 2): 01.30Z.

TAS.:
President — Mr. R. K. Emmett VK7KK
Secretary — Mr. H. E. Hewens VK7HE
Broadcasts— 3570, 7130 kHz: 09.30 EST.

Postal information:
VK1 — P.O. Box 1173, Canberra, 2601
VK2 — 14 Atchison St., Crows Nest, 2065 (Ph. (02) 43 5795 Tues & Thurs (10.00-14.00h).
VK3 — 412 Brunswick St., Fitzroy, 3065 (Ph. (03) 41 3535 Sat 10.00-12.00h).
VK4 — G.P.O. Box 638, Brisbane, 4001.
VK5 — G.P.O. Box 1234, Adelaide, 5001 — HQ at West Thebarton Rd., Thebarton (Ph. (08) 254 7442).
VK6 — G.P.O. Box N1002, Perth, 6001.
VK7 — P.O. Box 1010, Launceston, 7250.
VK8 — (incl. with VK5), Darwin AR Club, P.O. Box 1418, Darwin, 5794.

Slow morse transmissions — most week-day evenings about 09.30Z onwards around 3550 kHz.

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Model HK-808. Heavy duty commercial hand key with full ball race pivots, heavy marble base and dust cover. The ultimate hand key. Price **$68.00**

Model HK-710. Heavy Duty De Luxe Hand Key, fully adjustable, ball bearing shaft, plastic protective cover. Mounted on heavy non-skid poly marble base. Base dimensions 168mm x 103mm. Price **$38.00**

Model HK-707. Economy hand key in all black ABS resin, metal parts protected by moulded ABS resin cover. **$19.00**

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Model TC-701. Morse practice oscillator with built in key and speaker. Including battery and earphone. Copy of morse code on case. Two can be wired together to form a practice communication set. Price **$20.00**

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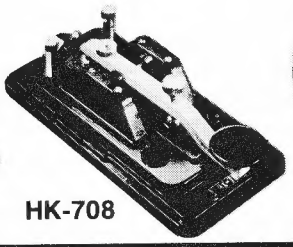
HK-707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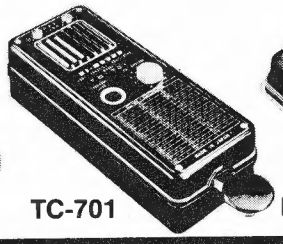
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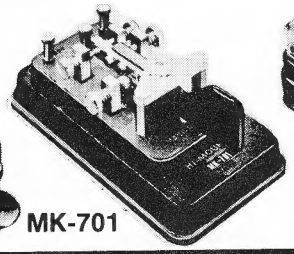
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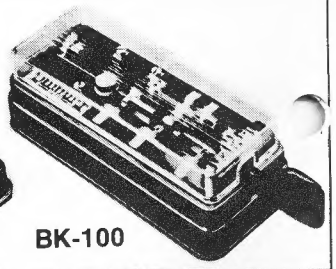
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SYNONYMOUS for QUALITY and ADVANCED TECHNOLOGY

KVG

Listed is our well-known series of 9 MHz crystal filters for SSB, AM, FM and CW applications.

Export inquiries welcomed

Filter Type	XF-9A	XF-9B	XF-9C	XF-9D	XF-9E	XF-9M	XF-9NB
Application	SSB-Transmit.	SSB Receive	AM	AM	FM	CW RTTY	CW RTTY
Number of Filter Crystals	5	8	8	8	8	4	8
Bandwidth (6dB down)	2.5 kHz	2.4 kHz	3.75 kHz	5.0 kHz	12.0 kHz	0.5 kHz	0.5 kHz
Passband Ripple	< 1 dB	< 2 dB	< 2 dB	< 2 dB	< 2 dB	< 1 dB	< 0.5 dB
Insertion Loss	< 3 dB	< 3.5 dB	< 3.5 dB	< 3.5 dB	< 3.0 dB	< 5 dB	< 6.5 dB
Input-Output Termination Z_t	500 Ω	500 Ω	500 Ω	500 Ω	1200 Ω	500 Ω	500 Ω
Termination C_t	30 pF	30 pF	30 pF	30 pF	30 pF	30 pF	30 pF
Shape Factor	(6:50 dB) 1.7	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.3	(6:40 dB) 2.5 (6:60 dB) 4.4	(6:60 dB) 2.2 (6:80 dB) 4.0
Ultimate Attenuation	45 dB	> 100 dB	> 100 dB	> 100 dB	> 90 dB	> 90 dB	> 90 dB
Price	$33.55	$47.75	$51.40	$51.40	$51.40	$35.95	$67.15

In order to simplify matching, the input and output of the filters comprise tuned differential transformers with the "common" connections internally connected to the metal case.

Registration Fee: $2.00; Air Mail: 31c per ½ oz. Shipping weights: Filters 2 oz. ea., Crystals ½ oz. ea. All Prices in U.S. Dollars.

Matching Oscillator Crystals

XF900 Carrier	9000.00 kHz	$4
XF901 USB	8998.5 kHz	$4
XF902 LSB	9001.5 kHz	$4
XF903 BFO	8999.0 kHz	$4
F05 Crystal Socket (HC 25/u)		.50

Oscillator Crystals 50 kHz through 150 MHz available to order. Parallel resonant (30 pF) to 20 MHz, series resonant above 20 MHz. Write for quotation to your requirements (include mechanical size & frequency).

Matching FM Crystal Discriminators for XF-9E

	Freq. Dev.	Slope	Price
XD-9-01	+ 5 kHz	—40 mV/kHz	$25.30
X9-9-02	+10 kHz	—24 mV/kHz	$25.30
XD-9-03	+12 kHz	—50 mV/kHz	$25.30

SPECTRUM INTERNATIONAL INC. Box 1084A, Concord, Mass. 01742 USA

WIANEWS

SPECIAL ANNOUNCEMENT

As this edition was going to press, the Postal and Telecommunications Department announced that Novice licensees had been allocated the frequencies of 28.1 to 28.6 MHz, effective from the 6th July, 1977.

It was further announced that all amateur radio operations within the existing 11 metre allocation (26.96 to 27.23 MHz) would cease as from 26th July, 1977. (See reproduced letter on page 6.)

The Institute, however, has been very active in seeking adequate compensation in relation to this band. The Institute has also been extremely active concerning other matters affecting, or likely to affect, radio amateurs by the introduction of CB. Those who are interested can rest assured that all the necessary homework has been done.

The Institute has never been an opponent of CB but it has stated on numerous occasions that proper controls are essential.

The general view is that a percentage of CB-ers will feel the need to expand their interests beyond the narrow confines of their service. The present Novice licence in amateur radio is seen as the logical step to cater for this expanded interest.

As a result, a great number of new Novice classes by WIA and other organisations have come into being, and in this field the very popular correspondence courses run by the Westlakes Radio Club, and others, show how the increasing need is being filled and, indeed, the extent of that need. The Novice examination statistics will reflect this expansion more and more. The number of enquiries about Novice licensing continues to grow and interest in the WIA sponsored trial Novice examination will increase correspondingly.

The introduction of the CB service on 1st July will affect the future of the Australian amateur service most severely unless the P and T Department can increase its staffing needs.

CB will affect radio amateurs in more ways than one. CB frequency allocations are published elsewhere in this issue.

CANBERRA LAND SITE

The Federal Treasurer prepared a financial statement about the Canberra land site proposals received from the very active and well-informed ACT Divisional Committee and circulated this to Divisions.

Replies received indicate that, owing to the magnitude of the initial sum to be found, and because of our comparatively small membership, the scheme has been considered premature at the present time. The detailed work is on file for future reference.

EXECUTIVE

Because of changed business commitments, Mr. W. E. J. Roper had to resign from the Executive. His place has been taken by Surgeon Rear Admiral S. J. Lloyd, whose transfer interstate in the near future has been re-scheduled.

PUBLICITY

Chris Long has been involved for some time with historical amateur recordings, general items of historical interest, production of amateur segments for commercial radio stations and Victorian Division broadcasts. He has now agreed to undertake similar work for the Executive and his active interest in general publicity for the WIA should prove extremely valuable when he has become accustomed to the broader issues involved. As the red background "800" recruiting folder stocks have now become exhausted a fresh edition is to be prepared for issue as early as possible.

INTERSTATE VISIT

The Federal President intends to pay an official visit to Western Australia towards the end of August. He is most anxious to meet as many VK6s as possible in Perth, Albany and other nearby centres during his short stay. He has also promised to attend the 25th SW Zone Convention in Griffith, NSW, during the first weekend in October and hopes to meet as many amateurs there as possible.

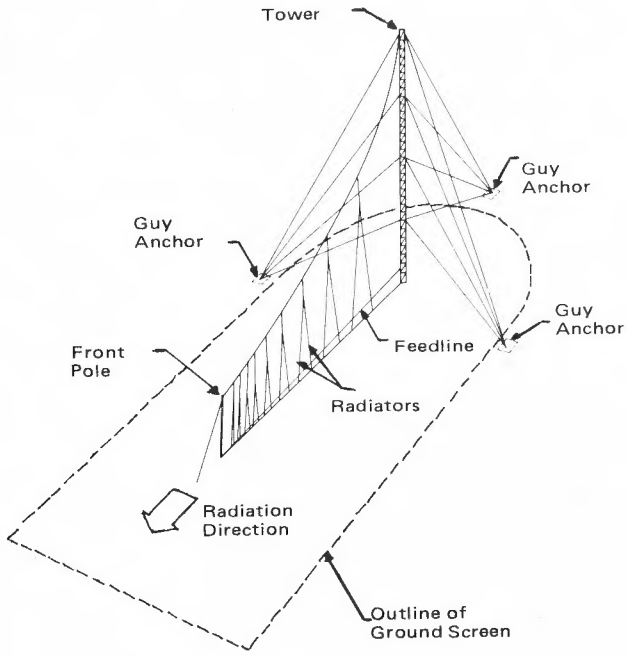
RETIREMENT

It is sad to record the retirement on health grounds of Mr. H. S. Young from the central office of the P and T Department. It is understood that Mr. D. Williamson is acting in the post. Throughout this decade, Horrie, as he is known to everyone, has been a tower of strength and advice for the amateur service under such conditions of change as have been seldom seen in amateur circles. Everybody will join together in wishing him a speedy recovery and a long and happy retirement. He will be giving the RD Contest opening address this year. ■

SCALAR

for Granger Associates

The 2726 Series of antennas is a family of monopole log-period arrays, the smallest, most economical configuration that can efficiently radiate a broad band of HF frequencies extending as low as 2.5 MHz. The antennas are intended for transmitting or receiving service for either point-to-point communications or sectorial broadcast.



★ For Long-Haul HF Communications

★ High Performance using little land area

★ Minimum Tower height

★ Frequency ranges 2.5 to 32 MHz, 3.5 to 32 MHz.

SCALAR Distributors Pty Ltd

VICTORIA: 18 Shelley Ave., Kilsyth, Vic., 3137. Ph: 725-9677
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QLD: Ph: 371-5677 **SA:** Ph: 42-6666 **WA:** Ph: 57-1555

VICTORIAN NOVICE AMATEUR EXAMINATION — 1977

REPORT OF EXAMINER

The April 1977 Trial Novice Examination was the first held by the YRCS in Victoria. It has been a great success and will be repeated annually or bi-annually from now on; the next Trial Exam is scheduled for April 1978. There were 61 candidates. The pass rates in the examination were as follows:

Theory section, 46%; Regulation section, 48%; Telegraphy section, 19%.

Only 15 per cent of candidates passed in all sections. This low pass rate was largely caused by the high failure rate in Telegraphy Receiving.

Theory scores ranged between 28 and 96, with a mean value of 64.9. Facility values (percentage correct on each item) ranged between 15 per cent and 92 per cent. The weakest area was the section on AC circuits, especially reactance and resonance which are not well understood.

Regulations scores ranged between 20 and 97, with a mean value of 66.2. Facility values ranged between 30 per cent and 98 per cent, and the weakest area was the section on the "Q" code. This should be remedied, since the "Q" code questions are very heavily weighted.

The Telegraphy Sending pass rate was 77 per cent, but the Receiving pass rate was only 18 per cent. Lack of adequate practice in receiving morse is the largest weakness of Novice candidates.

The above is only a very incomplete version of the full examiner's report, which takes a detailed look at the problems of candidates and should be useful to all Novice instructors. The full report will be published in the next issue of Zero Beat magazine, which will be available from YRCS headquarters in all States.

Every indication is that the Trial Exam greatly improved candidates' chances, so prospective Novices and Novice instructors in Victoria are strongly advised to make use of this service. ■

Happy faces show relief that CW exam just finished.

QSP

20th JAMBOREE-ON-THE-AIR 1977

The 20th Jamboree on the Air will be held over the week-end of 15th-16th October, 1977. Suggested starting time is 00.01 hours LOCAL time on Saturday 15th to terminate 48 hours later, i.e. 23.59 hours LOCAL time Sunday, 16th October, 1977. These are suggested times only; many stations find it more convenient to operate on the Friday evening and each station is completely free to select its own times and periods for operation. However, we suggest that there is a better chance of finding overseas stations if the suggested times are followed.

Local regulations must be strictly adhered to. It is suggested that you look for stations around the official **World** Scout Frequencies.

	Phone	CW
80 m		3.590 MHz
40 m	7.090 MHz	7.030 MHz
20 m	14.290 MHz	14.070 MHz
15 m	21.360 MHz	21.140 MHz
10 m	28.990 MHz	28.190 MHz

Listen **before** you call "CQ Jamboree" to ensure that the frequency is not already in use. Listen between overs to ascertain if overseas and other stations are endeavouring to contact you!

This year's participation certificate uses a symbol borrowed from New Zealand. This symbol was used in a "Come Alive" campaign some two or three years ago and is particularly appropriate for use in JOTA.

PLEASE NOTE: This year the World Bureau will operate under the call sign F0AA (Fox Zero Alpha Alpha) from the village of Ferney-Voltaire in France, just across the border from Geneva. With the support of the CERN and International Amateur Radio Clubs, and of the Verney-Voltaire Scouts, operation will be on all bands and modes for the full 48 hours of the event. It is also hoped to have an OSCAR satellite communication station in operation.

From Noel Lynch VK4ZNI

1977 CALL BOOK

The WIA 1977 Call Book should be available by the time you read this. Obtain your copy now from your Division. The cover price is $2.85, but postage and packing are extra — say 45 cents to be on the safe side. Bulk supplies are obtainable direct from the Executive office. Details about the call signs to be allocated to CB-ers became available too late for this issue but it is understood they will be issued in the following series — NA0001 up for NSW and ACT, PAA001 up for Tasmania, QAA001 up for Queensland, SAA001 up for South Australia and NT, VAA001 up for Victoria and WAA001 up for Western Australia. It is believed that the P and T Department will not be issuing lists of CB calls.

SATELLITES

A number of amateurs in this part of the world have expressed interest in a rumour that the USSR has launched, or is about to launch, an amateur satellite carrying a 2m to 10m band transponder. It is said that the transponder will be switched on from a date commemorating an advance in space technology — the possibility of a date in October has been mentioned. In the absence of any official news we must now wait and see.

WIA CORRESPONDENCE STOP PRESS

Commonwealth of Australia
POSTAL AND TELECOMMUNICATIONS DEPARTMENT
GPO BOX 5412CC, MELBOURNE, VIC., 3001

Reference: RB4/4/5
Telephone: 602 0151

Mr. P. B. Dodd 6/7/77.
Secretary
Wireless Institute of Australia
PO Box 150
TOORAK, VIC., 3142.

Dear Sir,

Reference is made to your letter of 10 June 1977, requesting permission for novice amateur licensees to use the frequency band 28.100 MHz to 28.600 MHz.

I am pleased to advise that, effective forthwith novice amateur station licensees are authorised to use the frequency band 28.1 to 28.6 MHz for transmissions in accordance with conditions applicable to novice amateur stations in the 3.525 to 3.575 and 21.125 and 21.200 MHz bands.

I must also confirm telephoned advice to the President of the Institute, Dr. Wardlaw, that, because of the introduction of the Citizens Radio Service, the band 26.96 to 27.23 MHz will be withdrawn from the Amateur Service during the period that the Citizens Radio Service is authorised to operate in this band. As you know, the Government has already decided that from June 1982 CB radio will operate exclusively on the Ultra High Frequency (UHF) band.

I must also confirm that the withdrawal will become effective on 26 July 1977.

Individual licensees will be informed by mail of the abovementioned changes as soon as possible but I would be grateful if publicity could also be arranged through avenues available to the Institute.

Yours faithfully,

(Signed) J. WILKINSON for Secretary.

RADIO TELETYPE

Jostein Gjerde LA7MC

Reprinted and translated from consecutive issues of "Amator Radio" — published by the Norwegian Radio Relay League.

PART 8

AN AUTOMATIC T/R CIRCUIT FOR ALL TYPES OF RTTY CONVERTERS

If you enjoy operating VOX then you will want KOX for RTTY.

This is the final article in the series.

You will have noticed that we have not gone into further details in this series of RTTY converters ST-5 and ST-6. ST-5 has been described in SHARG news and this seems to be the best and most interesting of the converters now available. ST-6 is of course, very good, but it includes many automatic parts which you, for the present, have no use for, so long as you have not settled on a call frequency. If you have so settled, you could set the receiver on this frequency with the auto-start system on, so that the machine starts and writes when someone calls. You would then also be able to receive messages without being present, when the transmission took place.

(There are established nets on most HF bands and also on 2 metres.—Ed.)

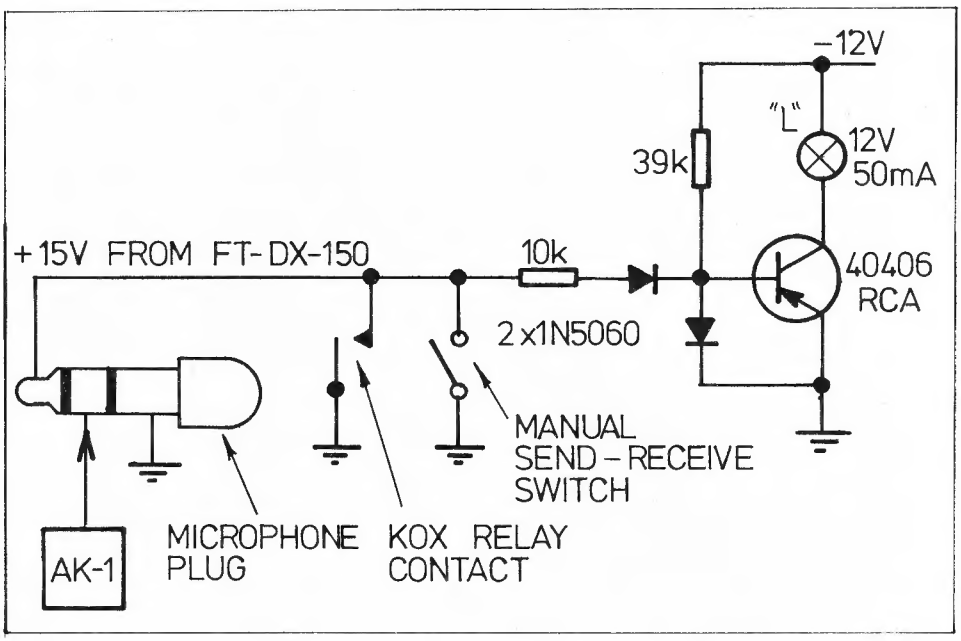


FIG. 2. Connection of an Indicating Lamp.

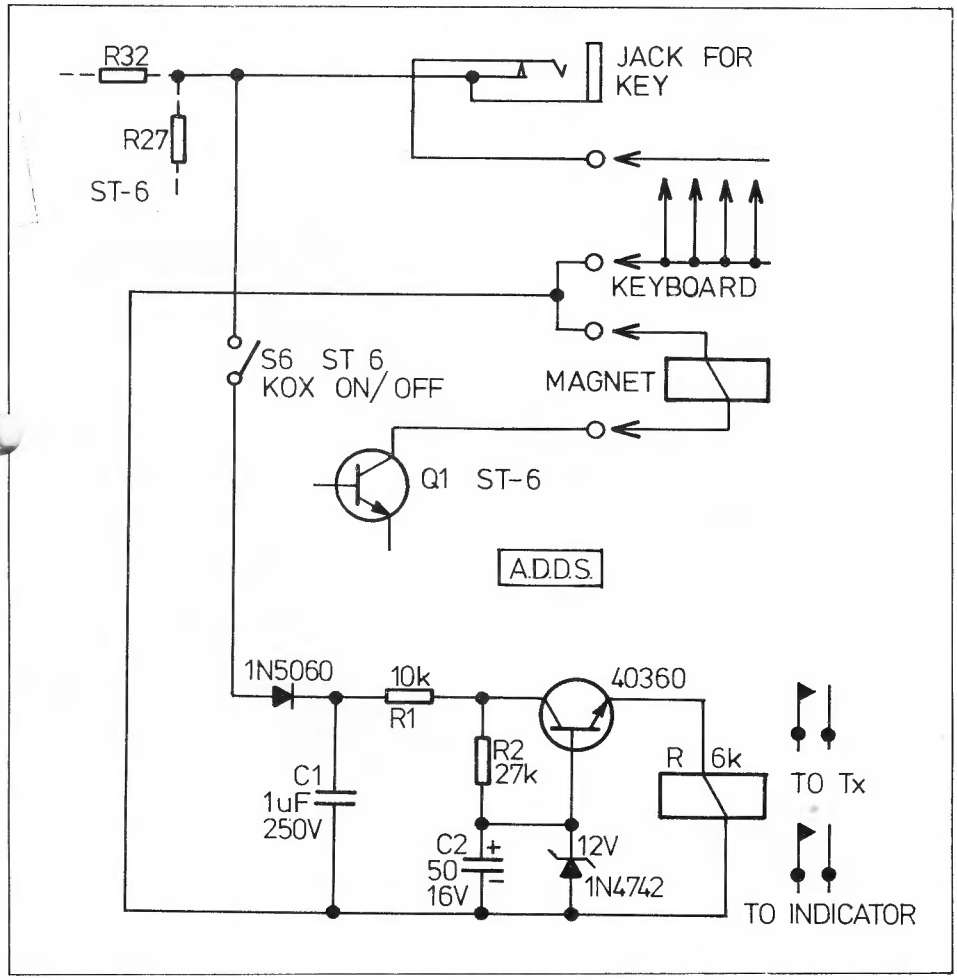


FIG. 1. KOX Operation Circuitry for use with ST-6 Converter.

KOX CIRCUIT

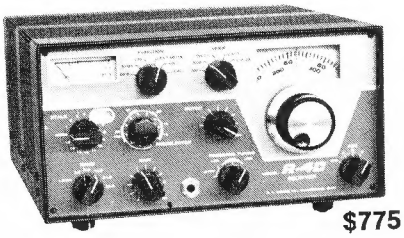
KOX, or key operated transmission, is a similar arrangement for RTTY as VOX is for SSB. That is to say, when you begin to transmit or type on your own keyboard, the transmitter will start by itself. There have been published many KOX circuits in magazines which explain the way you take a little of the keying voltage, amplify it and use it to drive the transmitter relay.

In respect of the popular converts ST-5 and ST-6 you run into difficulty with such a coupling. These converters use a so-called "floating loop". This will make it necessary that all voltages in the loop are keyed if you type yourself or receive signals through the receiver.

During reception the KOX should of course not operate. I have tested out a KOX coupling which is able to operate independently of which converter you use, and it is transistorised or valve operated.

Across the key contacts — keyboard or machine transmitter — there is a network which discharges itself slowly out through a relay (see Fig. 1). As soon as you begin to type the relay closes and "hangs" a little while after you stop typing. The "hang" time you can adjust by varying the size of C2. During reception both the keyboard and machine transmitter are short-circuited and there can, naturally, be no voltage across the network.

DRAKE® C-Line Amateur Equipment



$775

Drake R-4C

Solid State Linear permeability-tuned VFO with 1 kHz dial divisions. Gear driven dual circular dials. High mechanical, electrical and temperature stability.

Covers ham bands with crystals furnished. Covers all of 80, 40, 20 and 15 meters, and 28.5-29.0 MHz of 10 meters.

Covers 160 meters with accessory crystal. In addition to the ham bands, tunes any fifteen 500 kHz ranges between 1.5 and 30 MHz, 5.0 to 6.0 MHz not recommended. Can be used for MARS, WWV, CB, Marine and Shortwave broadcasts.

Superior selectivity: 2.4 kHz 8-pole filter provided in ssb positions. 8.0 kHz, 6 pole selectivity for a-m. Optional 8-pole filters of .25, .5, 1.5 and 6.0 kHz bandwidths available.

Tunable notch filter attenuates carriers within passband.

Smooth and precise passband tuning.

Transceive capability; may be used to transceive with the T-4X, T-4XB or T-4XC Transmitters. Illuminated dial shows which PTO is in use.

Usb, lsb, a-m and cw on all bands.

Agc with fast attack and two release times for ssb and a-m or fast release for break-in cw. Agc also may be switched off.

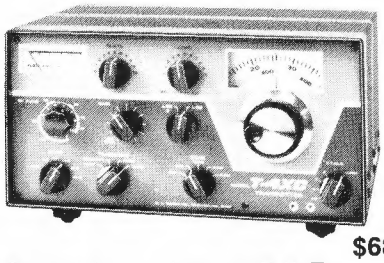
New high efficiency accessory noise blanker that operates in all modes.

Crystal lattice filter in first i-f prevents cross-modulation and desensitization due to strong adjacent channel signals.

Excellent overload and intermodulation characteristics.

25 kHz Calibrator permits working closer to band edges and segments.

Scratch resistant epoxy paint finish.



$685

Drake T-4XC

Solid State Linear permeability-tuned VFO with 1 kHz dial divisions. Gear driven dual circular dials. High mechanical, electrical and temperature stability.

Covers ham bands with crystals furnished. Covers all of 80, 40, 20 and 15 meters, and 28.5-29.0 MHz of 10 meters.

Covers 160 meters with accessory crystal. Four 500 kHz ranges in addition to the ham bands plus one fixed-frequency range can be switch-selected from the front panel.

Two 8-pole crystal lattice filters for sideband selection.

Transceives with the R-4, R-4A, R-4B, R-4C and SPR-4 Receivers. Switch on the T-4XC selects frequency control by receiver or transmitter PTO or independently. Illuminated dial shows which PTO is in use.

Usb, lsb, a-m and cw on all bands.

Controlled-carrier modulation for a-m is compatible with ssb linear amplifiers.

Automatic transmit-receive switching. Separate VOX time-delay adjustments for phone and cw. VOX gain is independent of microphone gain.

Choice of VOX or PTT. VOX can be disabled by front panel switch.

Adjustable pi network output.

Transmitting agc prevents flat-topping.

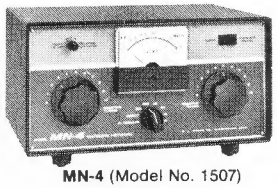
Meter reads relative output or plate current with switch on load control.

Built-in cw sidetone.

Spotting function for easy zero-beating.

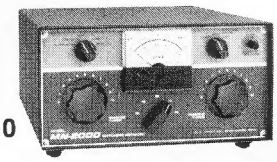
Easily adaptable to RTTY, either fsk or afsk.

Compact size; rugged construction. Scratch resistant epoxy paint finish.



$165

MN-4 (Model No. 1507)



$310

MN-2000 (Model No. 1509)

Drake MN-4 & MN-2000 Matching Networks

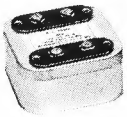
• **Integral Wattmeter** reads forward power in watts and VSWR directly; can be calibrated to read reflected power • **Matches 50 ohm transmitter output** to coax antenna feedline with VSWR of at least 5:1 • **Covers ham bands** 80 thru 10 meters • **Switches in or out** with front panel switch • **Size:** 5½"H, 10¾"W, 8"D (14.0 x 27.3 x 20.3 cm), MN-2000, 14⅜"D (36.5 cm).
• **Continuous Duty Output:** MN-4, 200 watts; MN-2000, 1000 watts (2000 watts PEP) • **MN-2000 only:** Up to 3 antenna connectors selected by front panel switch.

Drake MS-4

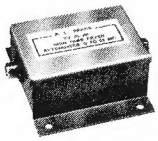
Drake MS-4 Matching Speaker for use with R-4, R-4A, R-4B and R-4C Receivers. (Has space to house AC-3 and AC-4 Power Supplies).

High Pass Filters for TV Sets

provide more than 40 dB attenuation at 52 MHz and lower. Protect the TV set from amateur transmitters 6-160 meters.



Drake TV-300-HP
For 300 ohm twin lead **$13**



Drake TV-75-HP
For 75 ohm TV coaxial cable; TV type connectors installed **$17**

TVI Filters

Low Pass Filters for Transmitters

have four pi sections for sharp cut off below channel 2, and to attenuate transmitter harmonics falling in any TV channel and fm band. 52 ohm. SO-239 connectors built in.

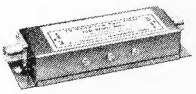
Drake TV-3300-LP

1000 watts max. below 30 MHz. Attenuation better than 80 dB above 41 MHz. Helps TV i-f interference, as well as TV front-end problems. **$3**

Drake TV-5200-LP

200 watts to 52 MHz. Ideal for six meters. For operation below six meters, use TV-3300-LP or TV-42-LP. **$32**

Drake TV-42-LP



is a four section filter designed with 43.2 MHz cut-off and extremely high attenuation in all TV channels for transmitters operating at 30 MHz and lower. Rated 100 watts input.

$19

Prices shown include Tax

Write, 'phone or call for technical information.

ELMEASCO

Instruments Pty. Ltd.

P.O. Box 30, Concord, N.S.W. 2137.
Telephone: 736-2888.
Melbourne: P.O. Box 107, Mt. Waverley, Vic. 3149.
Telephone: 233-4044.
Adelaide: 42-6666; Brisbane: 392 2884.
Perth: 25-3144.

I prefer to have an indicator lamp which will light on the converter when the transmitter is in use. If I had used a manual switch with an extra contact set and a relay with extra contact set in the KOX, I could have used the extra contacts to pass current directly to an indicator lamp. I did not have this and therefore used the coupling shown in Fig. 2. When the transmitter is not keyed, there is a voltage of +15 volts at the key-point in my transceiver (Sommerkamp FT—DX—150). This voltage blocks the transistor and the lamp is unlit. There is a protective diode from the base of the transistor to earth to protect the transistor in case the keyed voltage is higher. Many transistors do not tolerate fairly high voltages in the blocking direction for the base/emitter diode.

When you have used KOX a while on RTTY you will see that it is an absolute necessity and will not manage without it.

Notes: This final article is marked "With this article finishes, **for the present,** this series on RTTY".

It could be that later numbers of the ARRL's "Amator Radio" may have continued the series. We hope you have enjoyed them.

RTTY operators may like to send a sketch of their favourite circuits or a photograph or two of their gear, K. ■

TELETYPES, Repairs, Changeover Mechanisms, Spares, Paper Rolls and Tape, MACHINES FOR SALE. **Network Engineering, 492 Jones St., Ultimo, N.S.W. 2007. Phone (02) 211-4630.**

THE MAN BEHIND THE MICROPHONE

Pictured here is Perc Anderson VK3PA, operating in his shack at Wallington, near Geelong. Perc has been active for almost 50 years on all bands from MF to VHF. Although officially retired, Perc leads an active life in the community.

Perc may be regularly heard as Net Controller of the ANZA net (3 p.m. EAST daily on 14.138 MHz) and as Pacific DX Net Controller on Fridays (0600 UTC on 14.265 MHz).

Although now mainly active on 20 metres with his FTDX570, FL2100B, TH6 combinations, Perc maintains a regular sked each week on 80 metres. A speech compressor is used to add punch to the signal and an SB610 monitor and YC-355D frequency counter ensure that not only is the signal clean but also right on frequency.

First licensed in August 1928, Perc was the first VK to use a class B modulator on the MF broadcast band. Many listeners will still recall his fine AM broadcast band signals during 1931-39. When he discusses these past days a certain nostalgia is apparent when valves such as the 201, 210 and 46s are mentioned.

The spacious shack is set in a very well kept garden which produces not only attractive blooms but also prize-winning vegetables. ■

CITIZENS BAND FREQUENCY ALLOCATIONS

The Postal and Telecommunications Department Radio Frequency Management Division has issued Booklet Ref. No. RB14 concerning the conditions governing the licensing and operation of the Citizens Radio Service.

Frequency allocations are as follows:—

HF CHANNELS

Maximum Transmitter Power Output — 4 watts (AM), 12 watts (PEP, SSB).

Ch. No.	Frequency MHz	Remarks
1	27.015	
2	27.025	
3	27.035	
4	27.045	
5	27.065	Suggested Emergency Calling.
6	27.085	General Calling.
7	27.095	
8	27.105	
9	27.115	
10	27.125	
11	27.135	
12	27.155	
13	27.165	
14	27.175	
15	27.185	
16	27.195	
17	27.205	
18	27.225	

The above allocation for the Citizens Radio Service is temporary only, and is effective from 1st July, 1977, to 30th June, 1982, when all CB operations within this band will be required to cease.

UHF CHANNELS

Transmitter output power — 5 watts Pm.

Ch. No.	Frequency MHz	Ch. No.	Frequency MHz
1	476.425	21	476.925
2	476.450	22	476.950
3	476.475	23	476.975
4	476.500	24	477.000
5	476.525	25	477.025
6	476.550	26	477.050
7	476.575	27	477.075
8	476.600	28	477.100
9	476.625	29	477.125
10	476.650	30	477.150
11	476.675	31	477.175
12	476.700	32	477.200
13	476.725	33	477.225
14	476.750	34	477.250
15	476.775	35	477.275
16	476.800	36	477.300
17	476.825	37	477.325
18	476.850	38	477.350
19	476.875	39	477.375
20	476.900	40	477.400

Remarks: Channels 1 to 10 and 36 to 40 may be used without restriction.

Channels 11 to 35 will be available to the Citizens Radio Service at a date to be announced.

Note: The UHF segment is **not** an amateur band and amateur operations within the above segment are not permitted.

Licensing details, etc., are available from the above booklet RB14, obtainable from the Radio Branches.

We stress that amateur operators are not permitted to work Citizen Band stations without first obtaining the appropriate CB licence (cost $20 per CB unit). Naturally the normal distress regulations apply. ■

QSP

MURPHY AGAIN!!

Some readers are probably aware that the captions under the photographs on page 16 of July AR were reversed.

We try, but you can't win them all.

—VK3UV.

ANTENNA MEASUREMENTS

This article explains in a simple manner what is involved in achieving accurate results in a field of measurement competitions which have quately understood. It is particularly relevant to the antenna gain masurement competitions which have become a popular feature of some VHF conventions and rallies. The original article was supplied by VK3ATN and is reprinted from "The Victorian VHF'er of February 1973.

Of all the measurements made in amateur radio communications systems, perhaps the most difficult and least understood is the measurement of antennas. For example, it is relatively easy to measure the frequency and CW power output of a transmitter, the response of a filter or the gain of an amplifier. These are all what might be called "bench" measurements because when performed properly all of the factors which influence the accuracy and success of the measurement are under your control. In making antenna measurements however, the "bench" is now your back yard. In other words, the environment surrounding the antenna can affect the results of the measurement. Control of the environment is not at all simple as it was for the "bench" measurement because now the "bench" may be rather spacious. The purpose of this report will be to describe antenna measurement techniques closely allied to those employed in an antenna measuring event or contest so that the measurements can be made successfully and with meaningful results. Hopefully, these techniques will provide a better understanding of the measurement problems resulting in a more accurate and less difficult task.

SOME BASIC IDEAS

An antenna is simply a transducer or coupler between a suitable feedline and the environment surrounding it. In addition to efficient transfer of power from feedline to environment, an antenna at VHF-UHF is most frequently required to concentrate the radiated power into a particular region of the environment. Because of the shorter physical wavelength at VHF-UHF as compared with HF, it is entirely practical and desirable to use antennas which concentrate almost all of their radiated power into a small region of the environment. This type of antenna is generally referred to as a *beam antenna.*

In order to be consistent in comparing different antennas it is necessary that the environment surrounding the antenna be standardized. This standard environment is referred to as *free space.* Ideally then, measurements ought to be made with the measured antenna so far removed from any environmental effects that it is literally in outer space, a very impractical situation. The purposes of the measurement techniques is therefore to simulate under practical conditions, a controlled nearly *free space* environment. At VHF-UHF and with practical size antennas, the environment can be controlled so that successful and accurate measurements can be made in a reasonable amount of space.

The electrical characteristics of an antenna which it is most desirable to obtain by direct measurement are:

1. Gain (relative to an isotropic source which by definition has a gain of unity).
2. Space radiation pattern.
3. Feed point impedance (mismatch) and,
4. Polarisation.

These characteristics will now be dealt with but in reverse order from that given above.

1. In general the polarization can be assumed from the geometry of the radiating elements. That is to say, if the antenna is made up of a number of linear elements (straight length of rod or wire which are resonant and connected to the feed point) the polarization of the electric field will be linear and polarized parallel with the elements. If the geometry of the elements is not consistently parallel with each other then the polarization cannot be easily assumed. This report will be directed to antennas whose polarization is essentially linear although the techniques can be extended to include all forms of elliptic polarization.

2. The feed point mismatch, although affected to some degree by the immediate environment of the antenna, does NOT affect the gain or radiation characteristics of an antena. That is to say, if the immediate environment of the antenna does not affect the feed point impedance, then any mismatch intrinsic to the antenna tuning reflects a portion of the incident power back to the source.

In a receiving antenna this reflected power is radiated back into the environment "free space", and can be lost entirely. In a transmitting antenna, the reflected power goes back to the final amplifier of your transmitter. In general an amplifier is *not* a good matched source to the feedline and if the feedline is very low-loss, the amplifier tuning may be altered to result in maximum power transfer to the antenna. This procedure is called conjugate matching in which the feedline is now part of a resonant system consistent of the mismatched antenna, feedline and amplifier tuning circuits. It is therefore possible to use a mismatched antenna to its full gain potential provided the mismatch is not so severe as to cause heating losses in the system especially the feedline and matching devices. Similarly, a mismatched receiving antenna may be conjugate matched into the receiver front end for maximum power transfer. In any case it should be clearly kept in mind that the feed point mismatch does *not* affect the radiation characteristics of an antenna. It can only affect the system efficiency.

Why do we include feed point mismatch as part of an antenna's characteristics? The reason is that for efficient system performance most antennas are resonant transducers and present a reasonable match over a relatively narrow frequency range. It is therefore desirable to design an antenna, whether it be a simple dipole or an array of yagis, so that the final single feed point impedance be essentially resistive and of a magnitude consistent with the feedline impedance which you plan to employ. Furthermore, in order to make accurate absolute gain measurement it is vital that the antenna under test accept all the power from a matched source generator; or, that the reflected power due to the mismatch be measured and a suitable error correction in gain be included.

Perhaps the simplest approach to the feed point mismatch error is to provide a reactive tuner and SWR indicator as close to the feed point as possible (Fig 1). With the antenna radiating towards a "free space" environment, usually straight up into the sky with no obstructions in the main beam, the reactive tuner is adjusted for minimum VSWR, preferably less than 1.50:1. This will assure that the maximum correction error in gain will not exceed 4 per cent or 0.18 dB if the VSWR monitor is accurate at 1.50:1. The absolute gain will always measure lower for a mismatched antenna. An alternative method employs a calibrated directional coupler and power indicator so that the forward (incident) and reverse (reflected) power ratio can be measured directly. The coupler-indicator comprises an SWR monitor. In general the directional coupler and power indicator can give more accurate results.

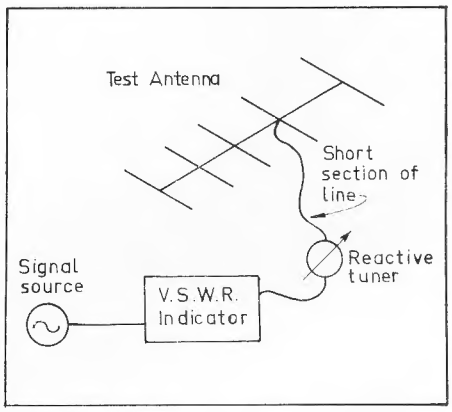


FIG. 1

It is essential that one of the above procedures be completed before gain

measurements are attempted. Not only will the proper correction or tuning be accomplished but an initially high SWR without the reactive tuner in the line will be an indicator that the antenna has not been adjusted for the nominal operating frequency. This is important with large colinear arrays or yagis whose intrinsic "Q" demands that the antenna be resonant at the desired operating frequency.

In concluding this section on impedance matching it should be pointed out that in an antenna measuring event or "contest" where many participants bring their antennas from far and wide to be evaluated and compared with other antennas, some compromises must necessarily be made. One of these may be that the test frequency be unchanged during the event which will naturally penalise those antennas which have been optimised for a specific frequency which is not the measurement frequency. The measurement committee will have to decide on the basis of additional complication and time consumption, whether each participant's antenna can be searched in frequency to determine its optimum performance frequency before any data is recorded.

Before leaving the subject of feed point impedance, mention should be made of the use of baluns in antennas. A balun is simply a device which permits a lossless transition between a balanced twinlead system, feedline or antenna and an unbalanced coax feedline or system. If the feed point of an antenna is symmetrical such as with a dipole and you desire to feed this antenna with an unbalanced feedline such as coax it is necessary to provide a balun between the line and the feed point. Without the balun current will be allowed to flow on the outside of the coax feedline. The current on the outside of the feedline will cause radiation and thus become part of the antenna radiating system. In almost every case this extra radiation from the feedline will be detrimental to the expected performance of the antenna.

ANTENNA TEST SITE (RANGE) SET-UP AND EVALUATION

Since an antenna is a reciprocal device, measurements of gain and radiation patterns can be made with the test antenna either as a transmitting or receiving antenna. In general and for practical reasons the test antenna is used in the receiving mode and the source or transmitting antenna is located at a specified fixing remote site and unattended. In other words the source antenna energised by a suitable transmitter is simply required to illuminate or flood the receiving site in a controlled and constant manner.

As mentioned earlier, antenna measurements ideally should be made under "free space" conditions. A further restriction is that the illumination from the source antenna be a plane wave over the effective aperture (capture area) of the test antenna. A plane wave by definition is one in which the magnitude and phase of the fields are uniform, and in the test antenna situation, *uniform over the effective area plane of the test antenna.* Since it is the nature of all radiation to expand in a spherical manner at great distance from the source, it would seem to be most desirable to locate the source antenna as far from the test site as possible. However, since for practical reasons the test site and source location will have to be near the Earth and not in outer space, the environment must include the effects of the ground surface and other obstacles in the vicinity of both antennas. These effects almost always dictate that the test range (spacing between source and test antennas) be as short as possible consistent with maintaining a "nearly error free" plane wave illuminating the test *aperture.*

A "nearly error free" plane wave can be specified as one in which the phase and amplitude from centre to edge of the illuminating field over the test aperture do not deviate by more than about 30 degrees and 1 decibel respectively. These conditions will result in a gain measurement error of no more than a few per cent less than the true gain. Based on the 30 degree error alone, it can be easily shown that the minimum range distance is approximately:—

$$S_{min} = 2\,D^2$$

— where

D = the largest aperture dimension

and = the "free space" wavelength in the same length units as D.

The phase error over the aperture D for this condition is 1/16 wavelength.

Since aperture size and gain are related,

$$\text{Gain} = \frac{4\quad Ae}{\quad 2}$$

where

Ae is the effective area.

The dimension D may be obtained as follows for simple aperture configurations.

For a square aperture . . . .

$$D = G\,\frac{\quad 2}{4}$$

which results in a minimum range distance of

$$S_{min} = \frac{G}{2} \text{ (square aperture)}$$

For a circular aperture . . . .

$$S_{min} = \frac{G}{2} \text{ (circular aperture)}$$

For apertures whose physical area is not well defined or is much larger in one dimension than in other directions, such as a long thin array for maximum directivity in one plane, it is advisable to use the maximum estimate of D from either the expected gain or physical aperture dimensions.

Up to this point in the range development only the conditions for minimum range length, Smin, have been established as though the ground surface were *not* present. This minimum S is therefore a necessary condition even under "free space" environment. The presence of the ground further complicates the range selection not in the determination of S but in the exact location of the source and test antennas above the Earth.

It is always advisable to select a range whose intervening terrain is essentially flat, clear of obstructions and of uniform surface conditions, i.e. all grass, pavement, etc. The extent of the range is determined by the illumination of the source antenna, usually a beam, whose gain is no greater than the highest gain antenna to be measured. For gain measurements the range extends essentially in the region of the beam of the test antenna. For radiation pattern measurements the range is considerably larger and consists of all that area illuminated by the source antenna, especially around and behind the test site. Ideally a site should be chosen where the test antenna location is near the centre of a large open area and the source antenna located near the edge and where most of the obstacles (trees, poles, fences, etc.) lie.

The primary effect of the range surface is that some of the energy from the source antenna will be reflected into the test antenna while the remaining energy will arrive on a direct line-of-sight path. This is illustrated in Fig 2:

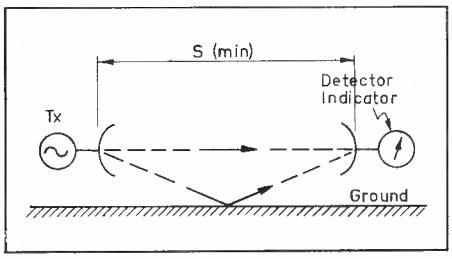


FIG. 2

The insistence on a flat uniform ground surface assures that there will be essentially a mirror reflection even though it may be slightly weakened (absorbed) by the surface material (ground). This mirroring of the source antenna is further illustrated in Fig 3 to show that the geometry may be readily analysed to determine the effects of ground reflection on the *amplitude variations* of the "nearly plane wave" arriving at the test aperture site.

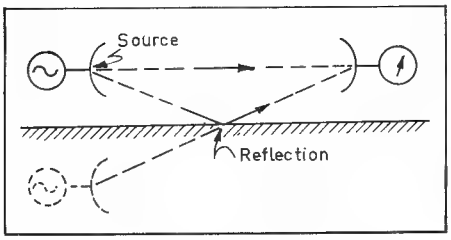


FIG. 3

In order to perform the analysis it is necessary to realise that reflected waves go through a 180 degree phase reversal upon reflection and that the resulting illuminating amplitude at a point in the test aperture is the vector sum of the electric fields arriving from the two directions, the direct path and the reflected path. If a perfect mirror reflection is

assured from the ground (it is nearly that for practical ground conditions at VHF-UHF) and the source antenna is an isotropic source, radiating equally in all directions, then a simple geometric analysis of the two path lengths will show that as the point where the fields sum is allowed to move in a vertical plane, the two field components (direct and reflected) will phase in and out. Since the field amplitudes are nearly equal, the resulting phase change due to the path length difference will produce an amplitude variation in the vertical test site direction similar to a standing wave as shown in Fig 4.

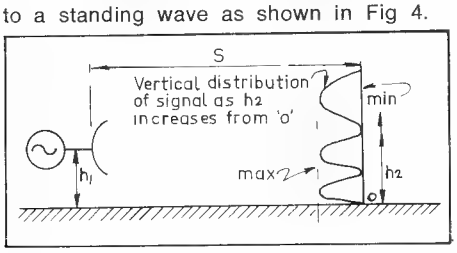


FIG. 4

The significance of this simple ground reflecting formula is that it permits the approximate location of the source antenna to be determined to achieve a "nearly plane wave" amplitude distribution in *vertical direction* over a particular test *aperture size.* It should be clear from examination of the height formula that as h is decreased, the vertical distribution pattern of the signal at the test site, h, expands. Also note that the signal level for h equal to zero is always zero on the ground regardless of the height h.

The object in using the height formula then is, given an effective antenna aperture to be tested from which a minimum S (range length) is determined and a suitable range site chosen, to find a value for h (source antenna height) such that the *first* maximum of vertical distribution at the test site, h, is at a practical distance above the ground and at the same time the signal amplitude over the aperture in the vertical direction does not vary more than about 1 dB. This last condition is not sacred but is closely related to the particular antenna under test. In practice then these formulas are only useful to initialise the range set-up. A final check of the vertical distribution at the test site MUST be made by direct measurement.

This measurement should be conducted with a small low gain but uni-directional probe antenna such as a corner reflector or 2 element yagi which is moved along a vertical line over the extended aperture site location. Care should be exercised to minimise the effects of local environment around the probe antenna and that the beam of the probe be directed at the source antenna at all times for maximum signal. A simple dipole is undesirable as a probe antenna because it is more susceptible to local environmental effects. The most practical way to instrument the vertical distribution measurement is to construct some kind of vertical track, preferably of wood, with a sliding carriage or platform which may be used to support and move the probe antenna. It is assumed of course that a stable source transmitter and calibrated receiver or detector are available so that variations of the order of ½ dB can be clearly distinguished.

Once these initial range measurements are completed successfully, the range is now ready to accommodate any aperture size less in vertical extent than the largest for which S min and the vertical field distribution were selected. The test antenna is placed with the centre of its aperture at the height of x h where maximum signal was found. The test antenna should be tilted so that its main beam is pointed in the direction of the source antenna. The final tilt is found by observing the receiver output for maximum signal. This last process must be done empirically since the apparent location of the source is somewhere between the actual source and its image, below the ground.

Before delving into the problems of measuring different types of antennas, a summary example of the procedure will now be given for a particular case. Assume that we wish to measure a 7 foot diameter parabolic reflector antenna at 1296 MHz.

Now a suitable site is selected based on the qualitative discussion given before. Next, locate the source height, h. The procedure is to choose a height h such that the first minimum above ground.

Place the source antenna at this height and probe the vertical distribution over the 7 ft. aperture location which will be about 10 feet off the ground. The measured profile of vertical signal level vs. height should be plotted and then empirically determine whether the 7 foot aperture can be fitted in this profile such that the 1 dB variation is not exceeded.

If the variation exceeds 1 dB over the 7 foot aperture, the source antenna should be lowered and h raised. Small changes in h, can quickly alter the distribution and test site.

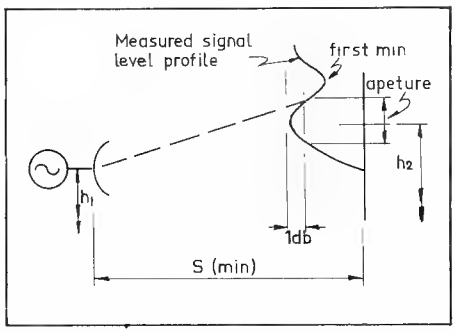


FIG. 5

Fig 5 illustrates the points of the above discussion. The same set-up procedure applies for either horizontal or vertical linear polarization with respect to the Earth surface. However, it is advisable to check by direct measurement at the site for each polarization to be sure that the vertical distribution is satisfactory. Distribution probing in the horizontal plane is unnecessary as little or no variation in amplitude should be found since the reflection geometry is constant. Because of this, antennas with apertures which are long and thin such as a stacked colinear vertical, should be measured with the long dimension parallel with the ground.

A particularly difficult range problem occurs in measurements of antennas which have depth as well as cross-sectional aperture area. Long end-fire antennas such as long yagis, rhombics, V-beams or arrays of these antennas radiate as volumetric arrays and it is now even more essential that the illuminating field from the source antenna be reasonably uniform in depth as well in plane wave in cross-section. For measuring these type of antennas it is advisable to make several vertical profile measurements which cover the depth of the array. A qualitative check on the integrity of the illumination for long end-fire antennas can be made by moving the array or antenna axially (forward or backward) and noting the change in received signal level. If the signal level varies less than 1 or 2 dB (for an axial movement of several wavelengths then the field can be considered satisfactory for most deman on accuracy. Large variations indicate th the illuminating field is badly distorted over the array depth and subsequent measurements are questionable. It is interesting to note in connection with gain measurements that any illuminating field distortion will always result in measurements which are lower than true value.

ABSOLUTE GAIN MEASUREMENT

Having established a suitable range, the measurement of gain relative to an isotropic (point source) radiator is almost always accomplished by direct comparison with a calibrated standard gain antenna. That is, the signal level with the test antenna in its optimum location is noted: Then the test antenna is removed and the standard gain antenna is placed with its aperture at the centre of location where the test antenna was located. The difference in signal level between the standard and test antennas is measured and appropriately added to or subtracted from the gain of the test antenna. Absolute he means with respect to a point sou which has a gain of unity by definition. The reason for using this reference rather than a dipole for instance, is that it is more useful and convenient for system engineering.

It is assured that both standard and test antennas have been carefully impedance matched into an appropriately matched and accurately calibrated detecting device.

A standard gain antenna may be any type of unidirectional, preferably planar aperture, antenna which has been calibrated either by direct measurement or in special cases by accurate construction according to computed dimensions.

One type of antenna which may be constructed to prescribed dimensions and will result in an absolute gain standard with a minimum gain of 15 dB and an accuracy of plus or minus 0.25 dB is a simple rectangular horn antenna often referred to as an optimum gain horn. At the end of this

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PETER SCHULZ, VK2ZXL

report is design information for standard gain horns for UHF bands.

In the VHF region of the spectrum horns are too large and impractical. In this region a standard gain antenna has been suggested by the National Bureau of Standards which consists of two inphase dipoles one half wavelength apart and backed up with a ground plane one wavelength square (Fig 6). When constructed accurately to scale for the frequency of interest this type standard will have an absolute gain of 7.7 dB with an accuracy of plus or minus 0.25 dB.

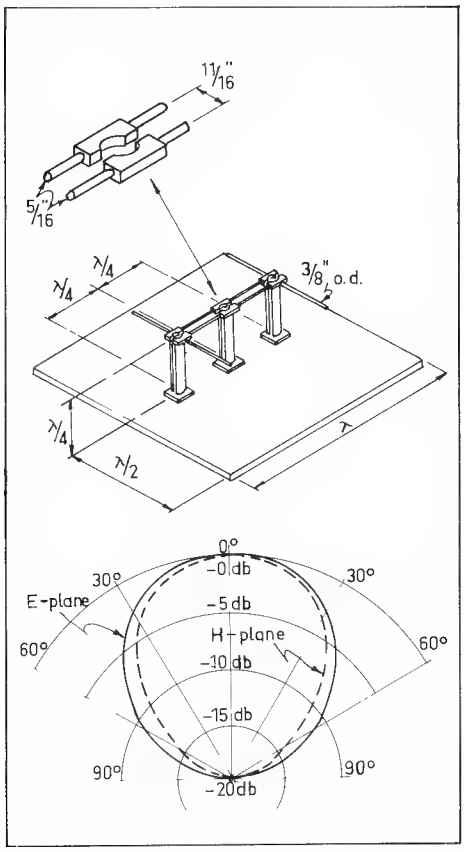

FIG. 6

RADIATION PATTERN MEASUREMENTS

Of all antenna measurements, this is the most demanding in measurement and most difficult to interpret. This section of the Report cannot hope to discuss all the details of radiation pattern measurements and their significance. We will confine ourselves to antennas of the beam radiating type and discuss the main radiation beam shape, its relation to the antenna gain and some discussion of sidelobe radiation.

Any antenna radiates to some degree in all directions into the space surrounding it. Therefore the radiation of an antenna is a three dimensional representation of the magnitude, phase and polarization of radiation over all directions. In general and in practical cases for amateur radio communications, the polarization is well defined and only the magnitude of radiation is important. Furthermore, in many of these cases the radiation in one particular plane is of primary interest, usually the plane corresponding to the plane of the Earth's surface regardless of polarization.

Because of the nature of the range set-up, measurement of radiation pattern can only be successfully made in a plane nearly parallel with the Earth's surface. This is illustrated by Fig 7 where the test antenna is rotated about an axis that is slightly tilted towards the source and extends through the centre of the test aperture. With beam antennas it is advisable and usually sufficient to take two radiation pattern measurements, one in the polarization plane and one at right angles to the plane of polarization. These radiation patterns are referred to in antenna literature as the principal E-plane and H-plane patterns respectively, E-plane meaning parallel with the electric field which is the polarization plane and H-plane meaning parallel with the magnetic field. The electric field and the magnetic field are always perpendicular to each other in a plane-wave as it propagates through space.

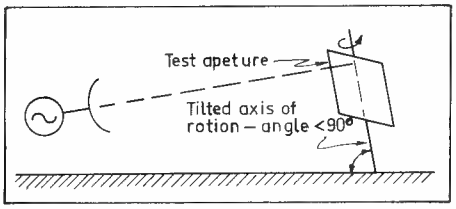

FIG. 7

The technique in obtaining these patterns is simple in procedure but requires more equipment or patience than a gain measurement. First, a suitable mount is required which can be rotated in the azimuth plane (horizontal approximately with the Earth surface) with some degree of accuracy in terms of azimuth angle positioning. Secondly, a signal level indicator calibrated over at least 20 dB dynamic range with a read-out resolution of at least 2 dB is required. A dynamic range of up to about 40 dB would be desirable but does not add greatly to the measurement significance.

With this much equipment, the procedure is to first locate the maximum of radiatoin of the beam antenna by carefully adjusting the azimuth and elevation positioning. These settings are then arbitrarily assigned an azimuth angle of zero degree and a signal level of zero decibels. Next, without changing the elevation setting (tilt of the rotating axis), the antenna is carefully rotated in azimuth in small steps which permit signal level read-out of 2 or 3 dB per step. These points of signal level corresponding with an azimuth angle are recorded and plotted on polar co-ordinate paper. A sample of the results is shown on polar co-ordinate paper in Fig 8 (note labelling and designation). On the sample radiation pattern the measured points are marked with (x) and a continuous line is "faired in" since the pattern is a continuous curve. Perhaps it is also worth mentioning that radiation patterns should preferably be plotted on a logarithmic radial scale rather than a voltage or power scale. The reason is that the log scale is more nearly how your ear responds to signal in the audio range and also most receivers have AGC systems which are somewhat logarithmic in response so that the log scale is more representative of actual system operation.

Having completed a set of radiation pattern measurements one is prompted to ask of what use are they? The primary answer is as a diagnostic tool to determine if the antenna is functioning as it was intended to function. A second answer is to know how the antenna will discriminate against interfering signals from various directions.

Consider now the diagnostic use of the radiation patterns. If the radiation beam is well defined then there is an approximate formula relating the antenna gain to the measured half power beamwidth of the E and H-plane radiation patterns. The half power beamwidth is indicated on the polar plot where the radiation level falls to 3 dB below the main beam 0 dB reference on either side.

The formulae is:—

$$\text{Gain} = \frac{40{,}000}{E \times H} \text{ approximately}$$

Where E and H are the half power beamwidths in degrees of the E and H-plane patterns respectively.

To illustrate the use of this formula assume that you have a yagi antenna whose boom length is two wavelengths. From known relations (handbooks) the expected gain of a yagi with a boom length of two wavelengths is about 13 dB, or in real numbers, G = 20. Using the formula the product of 0 x 0 = 2000 square degrees. Since a yagi produces a nearly symmetric beam shape in cross-section, 0 0 = 45 degrees. Now if the measured value of 0 and 0 are much larger than 45 degrees, like say 60 degrees, then the gain will be much lower than the expected 13 dB.

As another example, suppose that the same antenna (a 2 wavelength boom yagi) gives a measured gain of 9 dB but the radiation pattern half power beamwidths are approximately 45 degrees. This situation indicates that although the radiation patterns seem to be correct, the low gain shows inefficiency somewhere in the antenna, such as lossy materials, poor connections, etc.

Large broadside colinear antennas can be checked for excessive phasing line losses by comparing the gain computed from the radiation patterns using the formula with the direct measured gain. It seems paradoxical but it is indeed possible to build a large array with a very narrow beamwidth indicating high gain but actually having low gain due to losses in the array distribution system.

In general and for most VHF-UHF amateur radio communications gain is the primary attribute of an antenna. However, radiation in other directions than the main beam, referred to as sidelobe radiation, should be examined by measurement of radiation patterns for effects such as non-

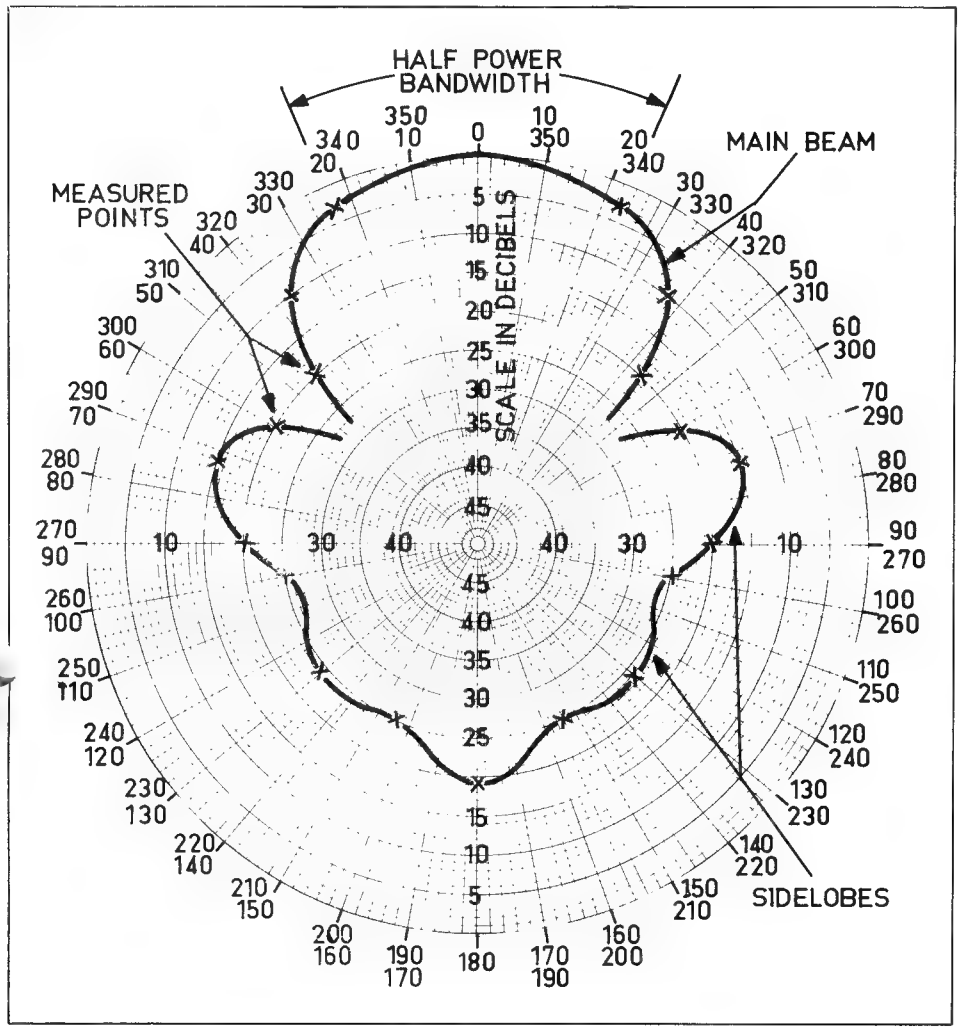

FIG. 8

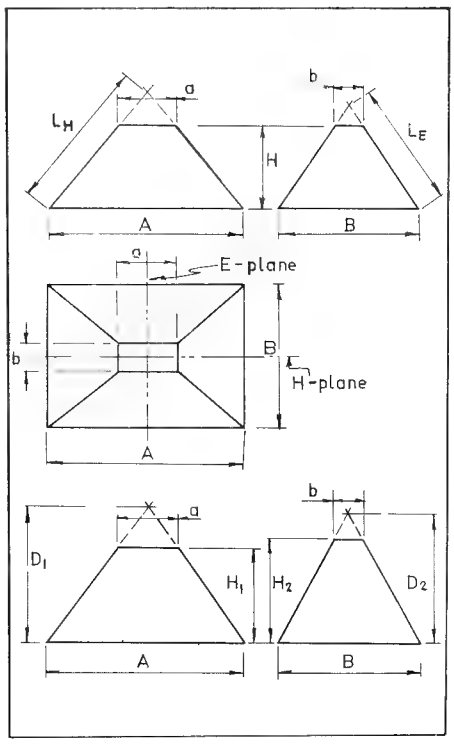

FIG. 9

symmetry on either side of the main beam or excessive magnitude of sidelobes (any sidelobe which is less than 10 dB below the main beam reference level of 0 dB should be considered excessive). These effects are usually attributable to incorrect phasing of the radiation elements or radiation from other parts of the antenna which was not intended such as the support structure or feedline.

The interpretation of radiation patterns is intimately related to the particular type antenna under measurement and handbooks should be consulted for the particular antenna type which you are measuring to verify that the measured results are in agreement with expected results.

To summarise the use of pattern measurements, if a beam antenna is first checked for gain (the easier measurement to make) and it is as expected, then pattern measurements may be academic. it is advisable to make the pattern measurements as an aid in determining the possible cause of low gain.

In concluding this discussion of radiation pattern measurements it should be strongly emphasised that the results measured under proper range facilities will not necessarily be the same as observed for the same antenna at your home station installation. The reasons should be obvious now after discussion of the range set-up, ground reflections and the vertical field distribution profiles. For long paths over rough terrain where many large obstacles may exist, these effects of ground reflection tend to become diffused although they can still cause unexpected results. For these reasons it is usually unjust to compare antennas over long paths. ■

STANDARD GAIN HORN DIMENSIONS

Design for optimum gain pyramidal horn is 3.1 dB below area gain.

Frequency MHz		1296	1296	2390	2390
Gain in dB		15	20	15	20
Rectangular waveguide		WR650	WR650	WR340	WR340
Waveguide ID	a	6.50	6.50	3.40	3.40
	b	3.25	3.25	1.70	1.70
Aperture Dimensions	A	21.47	41.67	11.62	22.56
	B	15.78	32.52	8.55	22.62
	H	8.19	47.45	4.49	22.83
Slant Heights	L	12.99	55.71	7.05	28.91
	L	15.92	59.96	8.60	32.44
Layout Dimensions	H	10.31	49.66	5.65	27.03
	H	11.10	50.60	6.09	27.55
	D	14.79	58.83	7.99	32.83
	D	13.98	56.22	7.59	30.49

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FINDING OSCAR WITH YOUR POCKET CALCULATOR

Ian Milne VK7IR

As David Hull remarked in the 1976 May issue of AR, exactly when to expect to contact the OSCAR satellites still seems to cause some difficulty. The following notes may help to simplify this problem, and should be read in conjunction with VK3ZDH's "Project Australis" column mentioned above, using the data for equator crossings given therein.

Two methods of using calculators are described here — others will have used similar schemes, but it is hoped that these will prove useful.

The first method uses a manual calculator such as the Novus "Mathematician" but could easily be adapted to suit whichever one is available, provided it has a storage memory.

The second process is more sophisticated and involves a programmable calculator. The program given is for an HP25 but others should be suitable. Using the time and longitude of the ascending node, the local time of the three evening passes, followed by the three for the following morning are obtained with just one keystroke for each time required. However firstly the manual method.

STEP	OPERATION
1	Store 28.73 in memory.
2	Put the longitude of the ascending node in the display — from AR data.
3	Recall memory.
4	Add.
5	Recall memory.
6	Add.
7	Continue this process until 165 or more appears in the display. For VK6 use 180 or more for this step.
8	Put the initial longitude in the display once more.
9	Subtract.
10	Recall memory.
12	Put 1.915 7 in the display (the orbital period.
11	Divide.
13	Multiply.
14	Insert the time of the ascending node as shown in the AR listing after first converting the minutes to decimal hours by dividing them by 60.
16	Insert 11.56, if using Eastern Standard Time, OR insert 11.06, if using Central Time, OR insert 9.56, if using West Australian Standard Time. (Add 1 to each of these if daylight saving is in use.)
17	Add.
18	Note the result and multiply the decimal part only by 60 to convert to minutes. The resulting answer is the time of the start of the first evening pass. The second pass follows 1 hour 55 minutes later, and the third 1 hour 55 minutes after that.

HP25 PROGRAM

Now the the easy way! Shown here is the program listing for the HP25 calculator. As programming takes a little time and care to set up the best way of doing things is to run through the whole of the AR data list for the month and make a note of the results. Or leave your calculator switched on at your operating position. (Not necessary with HP25S model — Ed.) It becomes tedious to put the program in each time and tends to defeat the simplicity of the method. Once set up the relevant numbers are placed in registers 1 and 2 and the R/S key is pressed. This will give the time of the first pass in hours and minutes. Pressing R/S again gives the second pass, and so on.

If there are other numbers in the calculator (for of course it can be used normally while the program is stored in it) these will have to be cleared. This may be done by successive "R/S" operations until the sequence settles down, displaying three evening passes followed by the *subsequent* morning passes. To recap, if you use the data for the tenth of the month you get the passes for the evening of the tenth and the morning of the eleventh.

The first pass will either be low on the Eastern horizon or about 45 degrees above the horizon to the East. The second pass will be between 45 degrees elevation East and 45 degrees elevation West, usually close to overhead. The final pass will be between 45 degrees elevation West and low on the Western horizon. The first and last passes may not always be heard in all areas.

HP25 PROGRAM

DISPLAY LINE	CODE	KEY ENTRY
00		
01	24 05	RCL 5
02	31	ENT
03	24 02	RCL 2
04	24 04	RCL 4
05	51	+ (add)
06	14 51	f x gr/eq y
07	13 09	GTO 09
08	13 04	GTO 04
09	24 02	RCL 2
10	41	— (subt.)
11	24 04	RCL 4
12	71	÷ (divide)
13	24 03	RCL 3
14	61	× (mult.)
15	24 06	RCL 6
16	51	+ (add)
17	24 01	RCL 1
18	15 00	g to H
19	51	+ (add)
20	14 00	f to HMS
21	74	R/S
22	15 00	g to H
23	24 03	RCL 3
24	51	+ (add)
25	14 00	f to HMS
26	74	R/S
27	15 00	g to H
28	24 03	RCL 3
29	51	+ (add)
30	14 00	f to HMS
31	74	R/S
32	15 00	g to H
33	24 03	RCL 3
34	24 07	RCL 7
35	61	× (mult.)
36	51	+ (add)
37	14 00	f to HMS
38	24 00	RCL 0
39	41	— (subt.)
40	74	R/S
41	15 00	g to H
42	24 03	RCL 3
43	51	+ (add)
44	14 00	f to HMS
45	74	R/S
46	15 00	g to H
47	24 03	RCL 3
48	51	+ (add)
49	14 00	f to HMS

Note that variations in the constants etc occur for different regions of Australia and this simple program can't allow for them all. The figures in the register 5, 6 and 7 are shown below for the Eastern States.

R0 24
R1 Time ascending node: hrs, min.
R2 Longitudinal ascending node: degrees
R3 1.915 7 (period)

R4 28.73 (increment)
R5 165
R6 11.56
R7 2.75

For other areas the following are suggested although some experimentation may be required.

R5 For VK6 180
R6 For VK5 11.06, for VK6 9.56
R7 For VK6 3.75

In all cases, if dayilght saving time is in force 1.0 should be added to the number to be used in register R6. For example 11.56 becomes 12.56, as in the manual program step 16.

The other variation to acquisition times that will occur is that in areas far north of the area for which the sums have been done; Tasmania — so of course that's most places. (Works FB in Melbourne without modification.—Ed.) In practice this means that for evening passes the satellite will be later in the North than calculated and in the morning passes will be earlier than calculated. This may be corrected, for instance, for North Queensland by adding 0.166 to register R6 (or step 16) and subtracting 0.1 from register R7. This is approximate only but should be close enough to allow experimental adjustment. Other regions between Northern Queensland and Tasmania may adjust their numbers on a "pro rata" basis. I shall be very interested to hear from users how this works out —— it may not be very important in practice except for overhead passes.

Well there we are. Hope to see you all via Oscar 6 or 7 — the programs work for both. ■

"RUA HAMA"

Alan Shawsmith VK4SS
35 Whynot St., West End, Brisbane, 4101

We all meet up with compulsives, like the worka, the slacka, the punter, or the alco — but have you ever come across a hama — a Hamaholic? Maybe you're even one yourself and don't know it. On the law of averages, there has to be quite a few in every AR group.

A Hamaholic is a poor enslaved soul, who needs another QSO like an alco needs another drink. Hamming is the peer of pastimes and it's right to be keen, even dedicated — but there's a dividing line between keenness and compulsion. In one, you're the boss, the other, the slave.

How does a Ham get this way? Some are so born, that getting "hooked" on one thing or another is their final lot, no matter what. For others, chronic marital punch-ups, or "rat race" stress will, in time, do in the best of us. Those put down by a nagging bag of strife (YF), or salt mine sweat, withdraw from their world of dragons and disasters to the shelter of the den, where they are accepted with no judgements made. Eventually, the shack is to them what a pub is to an alco: the only world worth being in.

There is the avid DXer who sees the top of the DXCC Totem Pole as the heavenly achievement of all AR has to offer: a Hilary on Everest. All praise and status will be his, if he makes it. It's the staying there, rather than the making it, that produces the neurosis. He can't afford to miss just one new country or DXpedition.

Then there is the obsessive who sits permanently at the rig. His real need isn't for a QSO but an ego boost; turned on by the narcissistic infatuation of his own "duck talk".

The Amateur's code clearly insists that our hobby falls into its rightful place with our other demands. This puts it well down the priority list with those who are committed to the saltmines, OG and harmonics — especially the VHF discordant ones. However, when one goes on the air and hears the same old familiar calls, local and DX, clamped to the same spot on the bands, the question has to be asked, "Are they perchance only on when I am, or do they live there?"

One does not need to visit many Ham shacks to feel the antivibes created by that psysically small but influential third party — the rig. Two's company, three's none. OM's don't seem to perceive that their uninitiated OG's are not enraptured by the miracle of space annihilation — especially if it's accompanied by a cacophany of interference. They would much rather chat over a cuppa with neighbours or friends.

A secret ballot conducted among the YF's, here, or anywhere else, on the question "Should your OM join H.A.? (Hamaholics Anonymous)" would likely result in a large "YES" vote.

The truth is often hard to face. If you have a sneaking suspicion about yourself, put the matter beyond doubt and take these tests. Just answer Yes or No.

1. If you can't manage to get on air almost every day, do you feel cheated?
2. Do you rack your brains planning how to maximize your "on air" periods?
3. (a) Do you put off taking a vacation because of the DX you'll miss? (b) When you do go, is it imperative to take a rig along? (c) If forced to go without a rig, do you, after a few days, begin to show the signs of the Pavlov dog syndrome — nervous, irritable, because your routine is out of sync?
4. If called from your bed in the night, do you turn on the rig to see what's doing?
5. If you have to stand in line for a QSO, do you feel impatient at the delay?
6. Is AR your only interest — by choice?
7. Do your friends who are not Hams now bore you?
8. Are your dreams most about AR? (If in colour, you could be in a bad way.)
9. Would you suffer the YF's nagging rather than leave the rig to do the chores?
10. Do you really burn if someone picks up a "rarie" you missed?

Answered in the affirmative (YES) — 60 per cent or less means you're about as rational as a Ham can be. Between 60 per cent and 80 per cent is the fringe or borderline area: take heart, you're with the majority. If 80 per cent and higher, it's "London to a brick" you've crossed over: you're "hooked", just as sure as any mainliner. It's not another QSO you need — nor a drink — but H.A., or a "headshrink". ■

TRY THIS

With the Technical Editors

Conduit and broom handle or a method of connecting a balun to a wire antenna.
Harry Capsey VK2OQ. ■

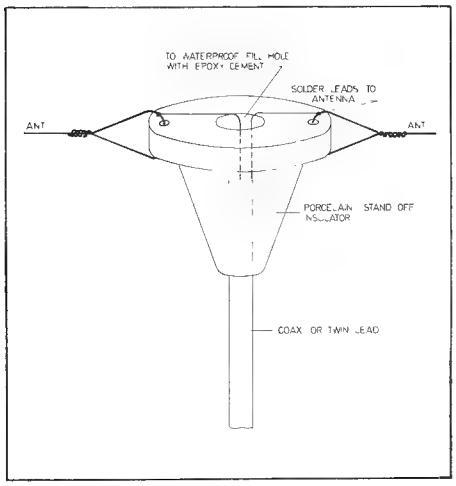

FIG. 1

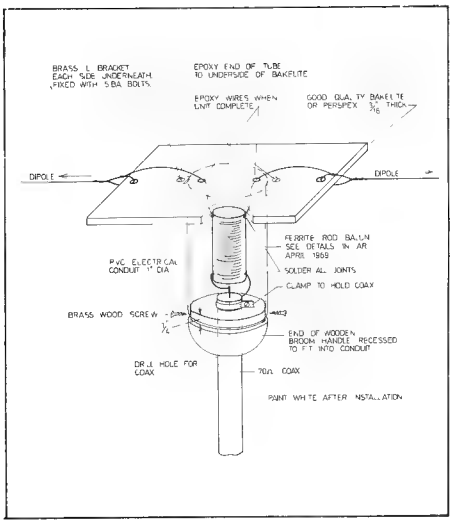

FIG. 2

To the new Ham . . .
VICOM wants you to

BEGIN WITH THE BEST!

As you develop your skills, increase your participation in Ham radio activities, and add hardware for everyincreasing flexibility of operations, you'll come to know **ICOM** from **VICOM INTERNATIONAL.** Just ask any old Ham. **ICOM** is the quality name in VHF/UHF Amateur Radio equipment because it is simply the best! **ICOM** is the line you'll want to move up to for unequalled quality and features.

But you needn't wait until you can trade in a truck load of equipment to reach up to **ICOM.** You can begin building your Amateur Radio operations with reasonably priced **ICOM** units that have flexible add-on features when you purchase your very first voice transceiver. And **ICOM** is backed in Australia by the technical expertise of **VICOM INTERNATIONAL** who have the experience and the spare parts necessary for the fine range of **ICOM** transceivers.

Dont · delay in moving up to **ICOM**: begin with the best!

Clockwise from lower left: **IC-211** 4MHz, 2 meter, All Mode Transceiver; **IC-245** Mobile 2 meter Transceiver; **IC-22S** Mobile VHF FM Transceiver; **IC-502** Portable 50 MHz SSB Transceiver; **IC-215** Portable 2 meter FM Tranceiver; **IC-30A** Mobile UHF FM Transceiver.

Current List Prices

TRANSCEIVERS		ACCESSORIES	
IC22S	$269	IC3PS matching power supply	$115
IC502	$219	BC20 nicad pack for IC202	$57
IC502	$219	IC50L 6m 10w linear amp.	$98
IC211	$785	IC20L 2m 10w linear amp.	$98
IC245	$479	Rubber Ducky for IC215	$13
IC215	$199		

VICOM 90 day warranty on all transceiver purchases.

ICOM

NEW PRODUCTS

The New NRD-505 Communications Receiver

VICOM CONTINUES TO BRING THE AMATEURS OF AUSTRALIA THE LATEST TECHNOLOGY.

Japan Radio Co have released a new all-wave receiver covering 100KHz to 30MHz in 1MHz ranges. JRC are noted world-wide for their excellence in marine equipment for both HF/VHF communications

The **NRD505** is designed specifically for the Amateur Radio operator with AM, RTTY, CW, SSB modes available.

The heart of the receiver is a PLL digital synthesiser which produces a frequency control in increments of 100Hz but with continuous fine tuning over 100Hz steps. Readout display is both digital and analog.

Optional reception of 4 pre-set spot frequencies with the selected frequencies stored in CMOS IC memory. Completely modular construction using 9 boards, no preselector tuning, high image rejection with a first IF of 70MHz creates a receiver with superb stability, sensitivity and versatility.

Standard features include noise blanker, AGC (fast/slow), attenuator, AF filter, RIT, separate BFO, IF output, RTTY line output, recording, phones monitor sidetone and external VFO.

A VFO converter to allow operation with any other transmitter will be available soon as an option

VICOM

P.S. If you are a potential professional user, don't pass this up!

Features·
Traditional front end tuning coils are out! In their place we have RF input filters electronically switched in 6 ranges between 100KHz and 30MHz.

The RF amp? Uses 2 bipolars in push-pull, the same goes for the mixer with 2 FET leading to the 1st IF 70.455MHz crystal filter.

Want to know more? Then send for the brochure. This new quality receiver is represented in Australia by **VICOM**.

VICOM

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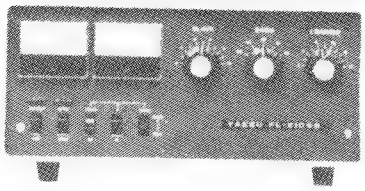
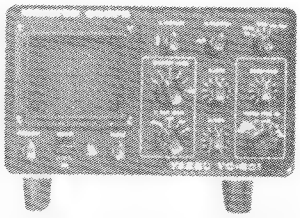
Direction: Russell J. Kelly
Peter D. Williams

Conditions of Sale: Prices & specifications subject to change without notice. Prices include sales tax but exclude freight & insurance. All items sent· Kwikasair (collect) or Ansett as directed. The law requires that a li nce be held for transmitting equipment.



The **FL2100B** linear uses two rugged 5/2B carbon plate tubes in class B grounded grid circuit with individually tuned input coils for each band. Covers 80 thru 10 metres at 1200W pep input Price **$524.**



You can maintain the cleanest sounding signal on the band with the **YAESU** YO301 Monitorscope Compatible with virtually all transmitters and receivers, the YO310 features all-mode monitoring including RTTY. Complete with comprehensive instruction manual Price **$339.**

ANTENNAS

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HW40	40 metres	$31	HW20	20 metres	$31
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RM80	80 metres	$26	RM20	20 metres	$22
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RSS—2 spring base		$11.50			
BM—1 bumper mount kit		$19			

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Space 2m ¼wave model 42S, complete with assembly	$14
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Lindenow 5/8 wave quality 2m (ecl base)	$26
Ringo Ranger ARX-2 for 2m	$45

NOISE BRIDGES

TE7—01 up to 100MHz	$38
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ANTENNA COUPLERS

CL66 HF incl coax switch	$139
CL65 HF	$128
CL99 for 2 metres	$59
CSW216 incl swr/pwr meter	$210

QM70 PRODUCTS

2 metre linear amplifier, 70w pep	$119
28/144 SCORPION transverter	$225
432/28 Converter	$50
144/28 Converter	$45
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MORSE KEYS

Economy model, HK708	$17
Operator model, HK706	$19
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Electronic Keyer, EK103	$149
MK701 Manipulator	$36

COAXIAL SWITCHES

CS201 Quality 2 position	$22

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AS-BL (Asahi) for beams	$30
BN-86 (Hy Gain) for beams	$30
BL50A, 50 ohms, 4kW model	$24
BL70A, 70 ohms, 4kW model	$24

LOW PASS FILTERS

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For 430 and 1296MHz	$349

ATTENTION FT101/E OWNERS

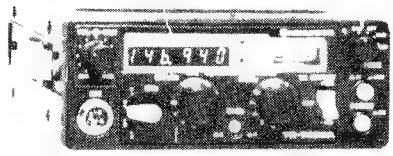
The new comprehensive service manual for the FT101 series is now available from **VICOM.** This supplement manual includes valuable information on trouble shooting, detailed data on pcbs, useful modifications — an absolute must for the ham wishing to maintain his/her/it's own gear. Price **$30** includes postage anywhere in Australia But be quick We only have a limited quantity!

VALVES	
6JS6C	$12
6146B	$10
6KD6	$14
572B	$50

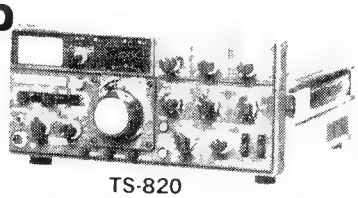
KENWOOD

pacesetter in amateur radio

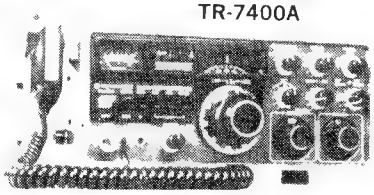
SPECIALS



TR-7400A



TS-820



TS-700A

Special prices this month only All prices are covered by VICOM 90 day warranty

TS520 80 thru 10 metres ac dc	$630
VFO820 VFO for above	$115
TS820S incl digital display AC	$960
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TV502 2m transverter	$260
TV506 6m transverter	$229
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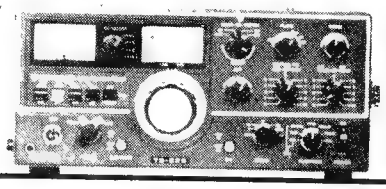
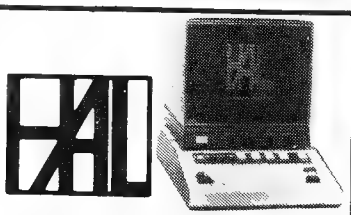
TS700A 2m ac dc fm ssb cw	$630
TR2200A 2m transceiver	$189
TR3200 70cm fm transceiver	$299
TR7400 2m fm synthesised transceiver	$379

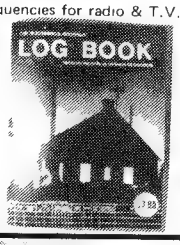


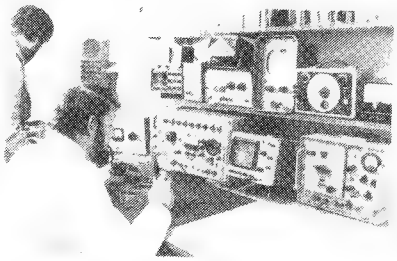


The new **HAL KSR3000** send/receive RTTY terminal including keyboard and video display, features scrolling, continuous, word or line transmission and firmware for word wrap-around and crankfill. Handles Baudot and ASC11 (8-level) with a screen size up to 1152 chs List price **$1499.** Write (including SAE) for complete specifications

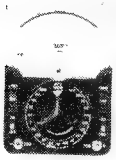
VHF HANDBOOK FOR RADIO AMATEURS: Includes information on FM theory, design, equipment, moon reflection and how to build converters and transceivers for VHF **$9 + P & P**

EA LOG BOOK: Packed with information, codes, frequencies for radio & T.V., FM standards, call areas etc **$2.95 + P & P**





VICOM have sophisticated technical facilities including spectrum analysis, high precision frequency generation to 600MHz and the necessary technical expertise to handle complicated communications equipment. Equipment includes the new Singer $10,000 FM10CS Communications Service Monitor, the first to be used in Australia for hobby electronics.



Model 150 Solid State FET VOM

Super sensitivity makes it suitable for any application in the field or on the bench

*11 megohm input resistance on all dc volt ranges.
*1 megohm input resistance on all ac volt ranges.
* temperature compensated for high accuracy.
* built-in overload protection

DC volts 7 ranges, 0.25 thru 1000 volts
AV volts: 4 ranges, 2.5 thru 1000 volts
DC amps: 5 ranges, 0 025 thru 250mA
Resistance. 5 ranges to 5000megohms
Decibels: 4 ranges
Complete with comprehensive instructions, test leads and batteries.

$57

20,000 ohms/volt General Purpose
Model TP-5SN

Accurate and dependable, 6 dc ranges, 5 ac ranges, 4 current ranges, 4 resistance ranges, capacitance and decibel ranges also. Price of **$29** includes instructions and test leads

DELUXE $29

DELUXE MIRROR SCALE MODEL 200
20,000 ohms/volt on 6 dc volt ranges
10,000 ohms/volt on 5 ac volt ranges.
Readings for capacity, resistance, decibels. An advanced multimeter for the professional, serious hobbyist or for the school lab. Price of **$29** is a real bargain for this quality instrument! Includes comprehensive instructions and test leads.

FOR THE TECHNICIAN

Model 117 FET PROFESSIONAL METER

Designed for the professional, the **FET** high input resistance ensures voltage measurement without effecting the circuit operation. Includes 7 dc ranges (to 1200v), 4 ac ranges (to 300v), 3 dc current ranges, 4 resistance ranges (to 2000meg) and 4 decibel ranges Price **$52** includes test leads and instructions.

SWR $36

The popular **VICOM VC2** swr and power meter is specially designed for the serious communicator looking for accurate readings. The bridge operates from 3 thru 150MHz with power measurement either 12 or 120 watts. Will handle up to 1000 watts Individually calibrated power chart for all Australian Amateur bands and 27MHz CB A real bargain at this price!

OSKERBLOCK PROFESSIONAL SWR/PWR METER

The professional bridge using thru line principle covers 3 to 200MHz with dual impedance 52 and 75 ohms. Each instrument individually calibrated and covers four power ranges: 2/20/200/2000 watts.

Standard model SWR200	**$69 + P&P**
Deluxe model SWR200B	**$79 + P&P**

RAK TRAP DIPOLES

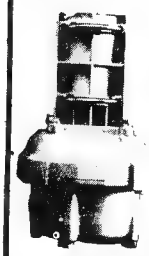
AL48DXN (40/80 metres)	$47
AL24DXN (20/40 metres)	$45
MIDY IIN (80/40/20m)	$48
MIDY IIIN (40 thru 10M)	$48
MIDY VN (80 thru 10m)	$58

Midy V N

ART-3000

ROTATOR

NEW



ART3000C Heavy Duty	$189
ART8000 Super Duty	$450

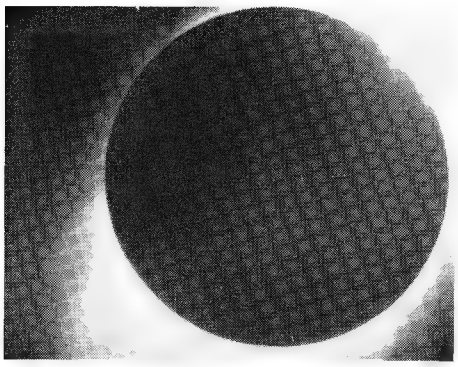
MODEL NO	ART 8000	ART 3000A
Rotating Torque	[illegible]	850kg cm
Braking Torque	[illegible]	[illegible]
Maximum vertical load	[illegible]	[illegible]
Accuracy	[illegible]	[illegible]
Drive Type	Gear	Gear
Power Requirements	May be modified upon request	
Operation Temperature	40° +80°	4[illegible] +80°C
Forward/Reverse Delay	3 seconds	[illegible] seconds
Maximum Continued OP	30 minutes	3 minutes
Mast Clamp	48φ 78φ	34φ 55φ
Cable Requirement	9 conductor	8 conductor
Net Weight	26kg	5.7kg
Shipping Weight	27.5kg	6.5kg

AN AR SPECIAL —

THE 1976 TOTAL SOLAR ECLIPSE

This is a report compiled from the recorded observations of many amateurs and others of the effects of the total eclipse of the sun that took place on 23 October 1976. A preview of this event was featured in AR October 1976. For most of us this was a unique experience.

As can be seen from the following detailed reports propagation was much as predicted, yet many unusual events were recorded. The changes in propagation are fascinating.



Photograph of 1976 Eclipse.
By I. Downes.

Perhaps one of the keenest and best prepared observers was Harry Roach a well known VK3 SWL. He writes "It is with some feeling of excitement that I have arranged five receivers, a panoramic adaptor and a tape recorder to monitor events as they happen". In addition Harry enlisted the help of five amateurs—VK3's EN, WU, TE, WQ, AMD. Now to the detailed composite report. The observations refer to the Melbourne area unless otherwise indicated.

BROADCAST BAND
3NE about 200 km NE of Melbourne rose from S7 to S9 plus 40 dB during totality. Deep QSB was apparent and the signal fell back to S7 as the light returned.

1.8 MHz
As totality approached ZL signals became audible and signals from Warrnambool, Geelong and Ballarat were greatly enhanced. Signals fell in strength as totality passed.

3.5 MHz
Weak signals to ZL during totality at Geelong. The signals peaked dramatically as the shadow moved East and faded right out five minutes later. Local VK3 signals peaked from S5 to S9 plus 20 dB during totality.

7 MHz
European DX was heard on this band until 15 minutes before totality when all but local VK's vanished until 16 minutes after totality. Signals to Sydney were observed to dip. XE1UF was worked during totality and five minutes later his signals disappeared into the noise. The band was back to normal 10 minutes later.

14 MHz
Good signals to UK5, ZS1, LZ1, DL8, ZE1, ZE7, G5, DL3, I3 during the eclipse but QSB and reduced signal strength from OK2BKK was noted during totality. Signals from VK7 peaked to S8 — VK7's are usually inaudible.

21MHz
Japanese signals were present all afternoon but no effects of the eclipse were noted.

27 MHz
DX signals from VK2, VK4 and JA heard in the morning but only local activity all afternoon.

28 MHz
A UA4 was worked in the morning. A weak VK8 was heard during the eclipse.

52 MHz
No apparent effects although an opening to Japan and Russia did occur that day.

144 MHz
The Melbourne beacon was monitored in Ballarat and suffered from fading up to 10 dB during totality. Before and after it was stable in strength.

432 MHz
Nothing heard.

7.5 MHz VNG
This signal was monitored in Sydney on a Barlow Wadley receiver which has a 0-5S meter scale. The average reading before and after the total phase was 2. For about ten minutes either side of totality the reading was 0.

So much for the observations of radio amateurs; what did other eclipse watchers see? L. A. Hajkowicz of the University of Queensland reported (Nature, Vol. 266, 10 March 1977) that US Navy satellites on 149.988 MHz were subjected to 5 dB of fading. This effect is attributed to gravity waves in the atmosphere. These waves are in essence a bow wave caused by the cooling of the air in the moon's shadow which is travelling rapidly eastwards. The waves are present at a great height and not noticeable to a ground based observer. M. Waldmeier of the Swiss Federal Observatory, Zurich, also reports (Nature. Vol. 265, 17 Feb. 1977) that the computer predicted visual appearance of the sun's corona was in satisfactory agreement with that actually observed.

CONCLUSIONS
The ionosphere changes rapidly from its day time to night time state in those areas experiencing totality. In the period when most of the sun is obscured intermediate conditions prevail.

Signals received after reflection from the shadowed part of the ionosphere are dramatically affected. Below, say, 4 MHz signals are enhanced, particularly those involving stations up to 3000 km apart, but situated on the line of traverse of totality. Signals around 7 MHz and 14 MHz were degraded although some signals were enhanced. The effects on higher frequencies were apparently negligible.

Some disturbances of the atmosphere, such as reduced temperature and gravity waves, degrade VHF signals. ■

MODIFICATIONS TO THE YAESU FT220 TRANSCEIVER

Steve Mahony VK5ZIM
19 Kentish Rd., Elizabeth Downs, 5113

A modification to enable "Reverse" operation on the Repeater mode, that is, listen normal transceiver transmitting frequency and transmit on normal transceiver listening frequency is described.

In the unit when the RPT button is ON and lamp ON, the transmit frequency is shifted down 600 kHz, by diode switching. To obtain RPT/REV all that is required is to transpose the two leads to the diode switching worked by the RPT switch. To eliminate the possibility of operating "Out of the Band", only one offset crystal is provided, on the FM/Repeater range, e.g. 146.5-147.0 MHz.

If the switch diodes are transposed with only a DPDT switch, trouble could be caused when the RPT switch is in the "OFF" position. To eliminate this, a

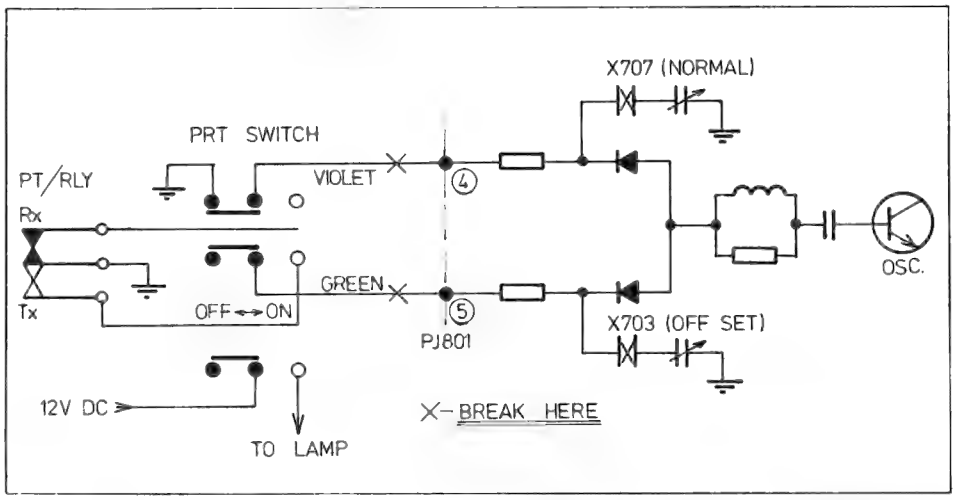


FIG. 1A: Original Circuit.

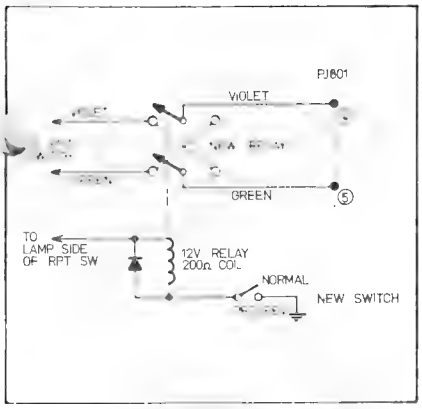
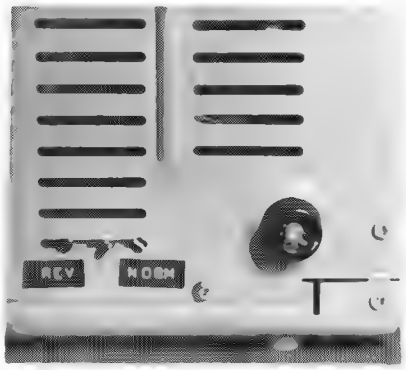


FIG. 1B: Modified Circuit.



Switch Mounting for Reverse Repeater Operation on FM.

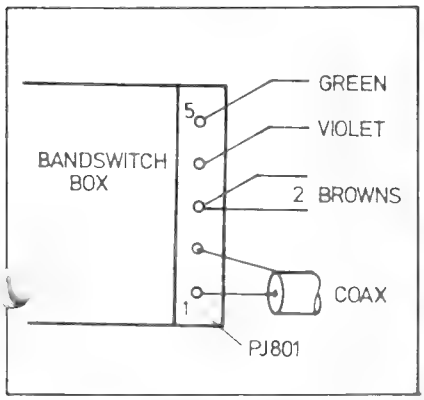


FIG. 2: Control Connections.

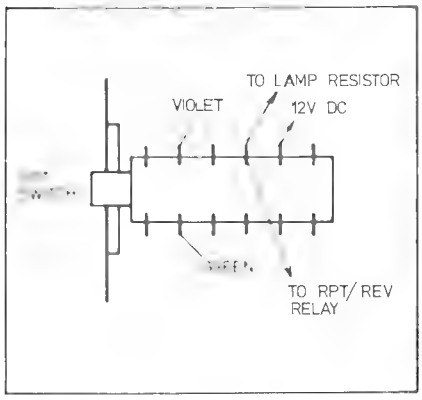


FIG. 3: Switch Wiring.

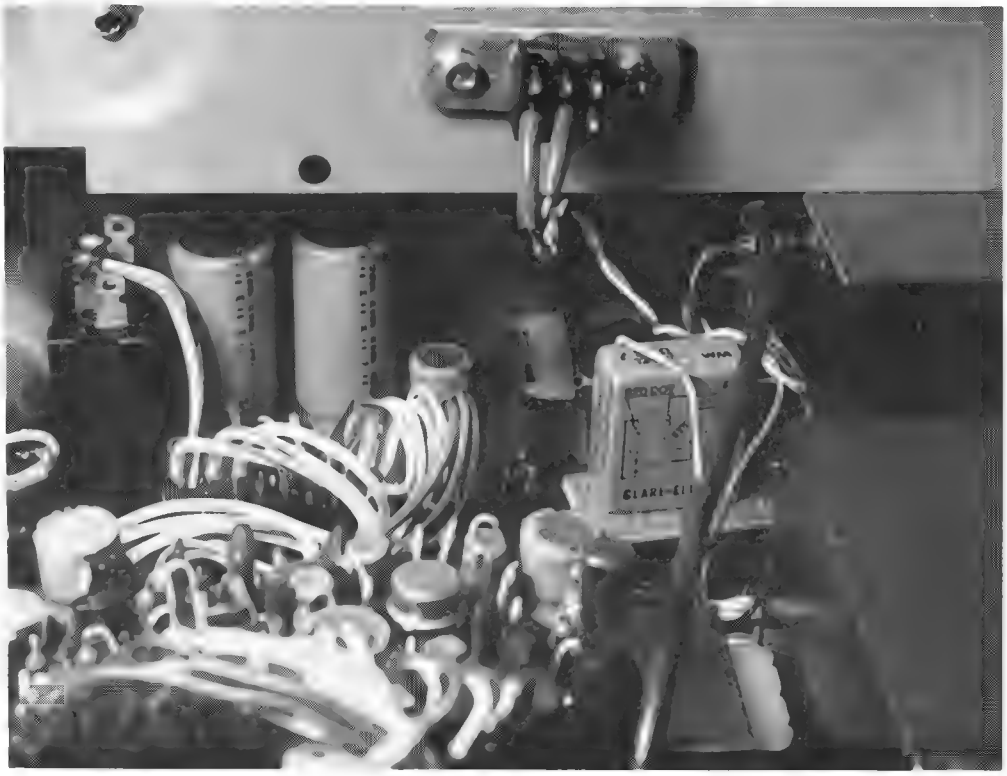


Photo shows Relay Mounting and Switch Location inside Unit to enable Reverse Operation of the FM Repeater Mode.

changeover relay is used, the operating coil of which is supplied from the DC used to light the RPT lamp. In this way the REV/RPT function can only take place when the RPT facility is used. On releasing the RPT switch the unit automatically resumes the NORMAL function.

As shown in the photograph the relay is mounted on a small bracket supported by the screw holding the band switching box quite close to the two switching leads.

The REV/RPT switch is mounted as shown in the photograph on a small metal plate, which is in turn mounted with only the toggle lever passing through the ventilating slots in the bottom plate on the same side as the RPT switch and just above the power supply. Mounting the switch in this way does not require any holes to be drilled in the case. The two DYMO labels save you embarrassment at a later date.

To operate RPT/REV you only reach along under the left side of the case and flick the switch with your finger. This modification to the FT220, besides enabling you to go REV Repeater, also allows you to listen on the segment of the FM band previously not covered, that is, 146.0-146.5 MHz. Because you are using the 600 kHz offset xtal, you actually cover 145.9-146.4 MHz, and just miss out on Ch. 49, 146.450 MHz.

Thanks to my wife, Christine, for her help in producing the photographs.

In conclusion, I have found the FT220 a delight to use, in both modes, FM and SSB. It proved itself two days after delivery by working VK6KJ at Albany from Elizabeth, S.A. ■

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Output Impedance	10 ~ 600Ω			
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AN OPERATOR'S EYE-VIEW OF THE HW7 AND QRP OPERATION

David S. Down, VK5HP
17 Brodie Crescent, Christies Beach, SA, 5165

To Bas VK3AUN, Noel VK4NL, Tony VK2BWC and Ken VK5XD whose perseverance, interest and enquiries inspired this article.

Articles on the Heathkit HW-7 QRP transceiver have appeared on odd occasions, AR May '73 and "73" Sept. 75 to name but two, but not much has been publicised regarding local operator evaluation of the rig, and how it is being used. This is such an article.

VK5HP runs one — it's been the main station Tx for some time — in company with an Eddystone EA12 amateur band Rx 40-20-15m quad and RSGB-style Z-match.

In general, QRP operation requires a lot of attention to otherwise neglected minute details such as antenna construction, methods of feeding and so forth, and suffice to say that coax is OUT and 75 ohm twinlead is IN for the quad feeder, tuned through the Z-match, with nothing but an SWR of 1:1 on all bands — this is ESSENTIAL.

Power supply for the rig comes from the circuit shown, Fig. 1, which will also run a solid state afterburner for the HW-7 for those times when conditions are not conducive for straight out QRP operation. Undoubtedly, this supply would lend itself to many other applications.

An A&R 5509 transformer may also be used, with the two 12.6V 2.5A windings arranged accordingly (wind yellows together and blues together).

The whole circuit is done on one ounce PCB and the 2N3055s sit on a 10 x 6cm sheet copper 3mm thick as a heat sink, and easily handle the amperage without running hot under normal load. Mica insulators are used under the transistors.

The 12.6V from the transformer becomes 16 to 18V DC from the bridge, and the BZY93 in the base circuit of the 2N3055 holds the output down to 13V. The 68 ohm 10W resistor limits the current to the zener so the diode dissipation is not exceeded.

The afterburner is styled along the lines of the VK3YS "Solid State Final for the FT-75" featured in Radio Bulletin April 74. It sports a 2N5589 driving a pair of 2N5591s in broadband amplifier configuration. For those interested, the HW-7 will also drive an 807 or 6146.

For those, like me, who don't like the choice of commercial rigs available in Australia, or the prices we are expected to pay for them, the HW-7 makes a nifty VFO for the Tx such as is under construction at this QTH where a 5763 acts as buffer/multiplier and drives a pair of 6146s. Bearing in mind the basic oscillator frequency of the HW-7 is 80m, a cheap and useful 80-40-20-15-10m Tx is the result. Crystal control for 160m is being incorporated too.

Modifications to the HW-7 thus far are:

1. Removal of the RSA antenna jack and fitting of an SO-239 type.
2. Xtal marker.
3. Fuseholder (and fuse!) to the power cable socket.
4. Diode polarity protection (we're all human).
5. Extra phone jack.
6. 6:1 reduction drive to the preselector capacitor.

In addition, an audio filter (88mH toroid in parallel with .15mF from ground to the midpoint of two .047mF capacitors in series between the kit phone jack and the added jack) may also be desirable to some HW-7 pilots.

Testing of the Rx section (thanks VK5JT) indicates that the Rx comes up to the performance claimed, and indeed, is very good considering the principle and simplicity involved. The USSR CQ-M contest was worked with the HW-7, and in spite of the above statement re the Rx, I am glad that the HW-7 Rx was not used solely for the 18 hours or so of operation!

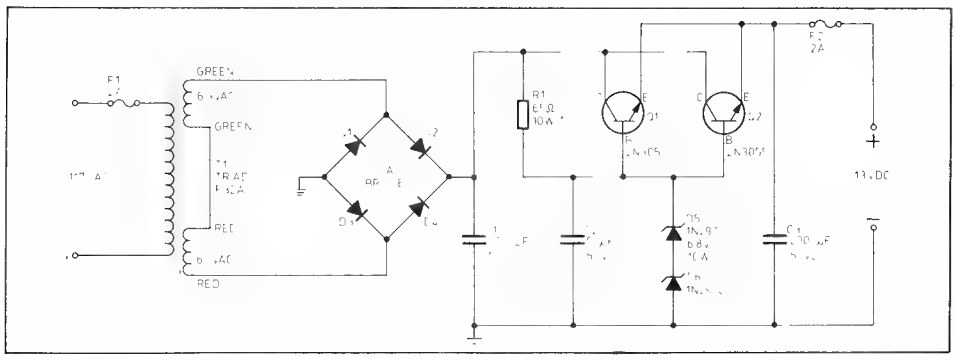

FIG. 1. POWER SUPPLY FOR HW7 AND ACCESSORIES

Conditions and QRM during that event would not have left me with intact nerves if the HW-7 had been used as a transceiver. A contest, involving 16-18 hours continuous CW operation is a fair test of rig as well as man, and from a transmitting point of view, the HW-7 came through with flying colours and neither missed a beat nor overheated. No-one complained of chirp, drift or any other problems, and the rig certainly sounded FB here.

For those who find the sidetone too harsh, try a .01 ceramic from base to collector of Q10, add a 47K between C45 and R34, change R35 from 1K to 270 ohms and see if the resulting note agrees with your palate. Personally, I prefer continuous off-the-air monitoring with a separate Rx, but each to his own.

A 6:1 reduction drive on the receiver preselector is a nice refinement — makes it a lot easier when trying to find the right pF out of nearly 400.

The break-in facility is good, responding well to any adjustment to suit individuality, and we haven't found the relay noise objectionable after even 1200 plus QSOs.

Perhaps the heavy breathers clutching calculators would like some figures from the Tx point of view.

Band	V (supply)	I (mA)	Pin	Pout	Efficiency
40	13	295	3.84W	1.6W	42%
20	13	300	3.9 W	1.5W	38%
15	13	277	3.6 W	0.99W	27%

40 and 15m have not been used extensively as maximum effort was sustained to achieve WAC, DXCC (105 countries) and several JA awards on QRP 20m between January and May 76. The 40m quad loop has been removed for a specific reason, but as soon as the new quad is erected, an assault will be made on those two bands.

It may be of interest to some, that of the 20 or so antennas tried, including Zepp, groundplane, 4 el beam and various quads, the quad eclipsed all others from this QTH even when allowing for height etc.

Obviously, each op, each QTH and associated antenna will indicate results differing from those with which I have been rewarded in a short space of time, but from an operator's point of view, the HW-7 is an excellent QRP transceiver for fixed station use (not yet tried /P).

If you want a budget-priced challenge, try one of these little rigs and feel the thrill when the op at the other end says *Unbelievable signals . . . . highest number of kms per watt (quote HB9AGK)* then bangs you a direct QSL within a fortnight.

If you are not keen on QSLing, DON'T take QRP up, because you surely will become interested in QSLing!

BCNU wid an HW-8 maybe??? ■

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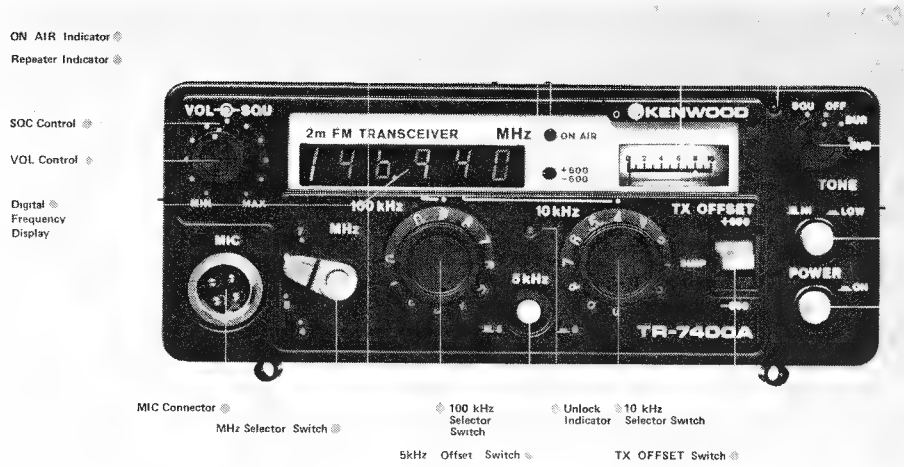

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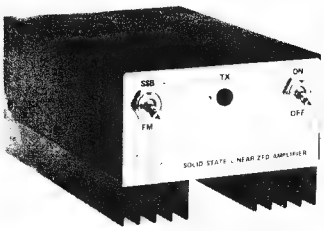

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Output Impedance	50 ohm nom., up to 3:1 VSWR acceptable with little degradation
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Power Supply	13.6V DC recommended for best results, 11-14V DC acceptable positive or negative ground
Pre-amp	18 dB nom. gain across entire HF band, 15 dB typ. at 50 MHz, 3-4 dB NF
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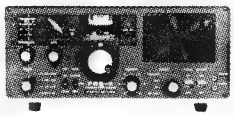

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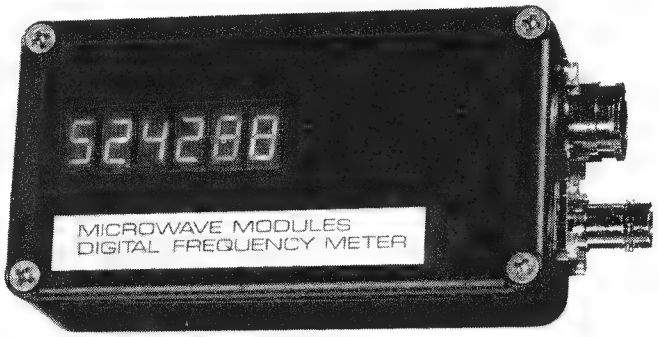
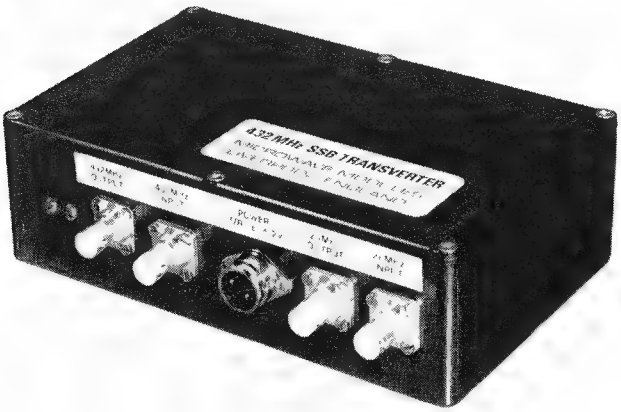
MODEL MMT432 — Price $215





MMT432 TRANSVERTER

500 MHz COUNTER

This counter has two ranges which are selected by supplying + 12 volts to one of two pins on the DIN socket. Internal diode switching brings the input in the 0.45 - 50 MHz range to a wide-band amplifier which drives a high speed TTL divider in the main counter logic. On the 50 - 500 MHz range the diodes switch in a high speed ECL prescaler and the demical point is changed accordingly.

A low angle AT cut quartz crystal is used giving a typical temperature stability of 0.5 ppm per degree C. Provision is made for setting the crystal frequency, and the accuracy of reading is normally better than 200 Hz at 50 MHz, or 2 kHz at 500 MHz.

The counter has reverse polarity protection and operates satisfactorily from a nominal 12V DC supply. A suitable 5 pin DIN plug is supplied.

SPECIFICATION

Digit Height	10 mm
Display Width	45 mm
Case Size	111 x 60 x 27 mm
Frequency Ranges	0.45 - 50 MHz, 50 - 500 MHz
Sensitivity	Better than 50 mV RMS over 0.45 - 50 MHz. Better than 200 mV RMS over 50 - 500 MHz
Input Connector	50 ohm BNC
Input Impedance	200 ohm approximately
Power Connector	5 pin 270 deg. locking DIN socket (supplied with plug)
Power Requirements	11 - 15 volts DC at 300 mA approximately

Model MMD050/500 — 500 MHz Counter, $175

New Release — 6 METRE MOSFET CONVERTER

FEATURES 24 MHz LOCAL OSCILLATOR OUTPUT FOR TRANSVERTER USE.

Input Frequency: 52-54 MHz
I.F. Output Frequency: 28-30 MHz
Typical Gain: 30 dB
Noise Figure: 2.5dB
Typical image rejection: 65dB
Crystal Oscillator Frequency: 24 MHz
Power requirements: 12 volt ± 25% at 35 mA.

MODEL MMC52/28LO — Price $49.00

2 METRE VERSION — WITH 116 MHz LOCAL OSCILLATOR OUTPUT FOR TRANSVERTER USE.

MODEL MMC144/28LO — Price $49.00

NEW READY-TO-OPERATE MODULES AVAILABLE IN THE SALES PROGRAM OF VHF COMMUNICATIONS

1296 MHz CONVERTER
Microstripline, Schottky diode mixer.
IF: 28-30 MHz or 144-146 MHz.
Noise figure: typ. 8.5 dB.
Overall gain 25 dB. **Price: $65**

432 MHz CONVERTER
2 silicon pre-amplifier stages. MOSFET mixer. All UHF circuits in microstrip technology.
Noise figure: typ. 3.8 dB.
Overall gain: typ. 30 dB.
IF: 28-30 MHz or 144-146 MHz 9-15 V 30 mA. **Price: $51.**

144 MHz MOSFET CONVERTER
Noise figure: typ. 2.8 dB.
Overall gain: typ. 30 dB.
IF: 28-30 MHz, 9-15 V 20 mA.
Price: $45

VARACTOR TRIPLER 432/1296 MHz
Max. input at 432 MHz: 24 W (FM, CW) - 12 W (AM).
Max. output at 1296 MHz: 14 W.
Price: $74

Pack and Post $1

All modules are enclosed in black cast-aluminium cases of 13 cm by 6 cm by 3 cm and are fitted with BNC connectors. Input and output impedance is 50 ohms. Completely professional technology, manufacture, and alignment. Extremely suitable for operation via OSCAR 7 or for normal VHF/UHF communications.

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HOW TO WIN RD AND/OR SIMILAR CONTESTS!

Doug McArthur VK3UM
30 Rollaway Rise, Chirnside Park, 3140

The true contest exponent has devoted many years of untiring dedication to achieve the remarkable results which place him head and shoulders above the average competitor.

It is far beyond the scope of this article to cover the vast range of methods employed to make one a top line contest operator without he himself spending the many years of additional practice that is so necessary for success. However if the reader takes the time to study this article he cannot fail to benefit and dramatically improve this contest standing.

Preparation is the keyword in contests and an ardent contests exponent paves his way far in advance to the date of the big event. Naturally, of course, you first select the contest you are to win. No negative attitude here, the emphasis is on win.

Anyone who has mildly dabbled in contest working quickly realises the inconvenience the XYL and harmonics have on contests. In fact Mr. Murphy's law indicates that a contestant's score is inversely proportional to his harmonics. We all are aware that XYL's require bread, milk and other essential supplies that must be obtained by yourself during the prime contest hours. Harmonics have to be taken to all manner of sporting activities again during prime contest hours. Needless to say this major obstacle has to be overcome and the simple answer is send them away for the week-end. It may cost a few "bob", however a true contest blueblood accepts this expense as necessary. Avoid at all times sending them to your mother-in-law. This situation causes undue stress at a later date when a return visit is inevitably accepted.

Family pets should be included in this exercise as everyone knows a barking dog punctuates call signs at the most inconvenient times. If one is forced to dog sit then the hound should be fed to such an extent that he is incapable of barking. Disconnect the phone.

The next step is to brief your neighbours about the strange astronomical phenomenon that will occur on this particular week-end. This strange effect will only last for this week-end and will not occur again for a further twelve months.

During this week-end this strange phenomenon will cause mysterious lines across TV sets, weird noises from tape recorders and hi fi's. Take special steps to assure your neighbours that it does not hurt any of the appliances (as it happens on your equipment too) but only lasts for this one week-end of the year.

The experienced contest operator always knows his rivals in the mastery of this fine art. The preceding week of the contest is dedicated in checking out your local QRM potential. Here you should note each particular station thus wise. Whilst he is in QSO with another station check your effective radiation capabilities against him. The noble art of carrier dropping (gleaned from 27 MHz operators) is used to ascertain if you flatten him or he flattens you. A careful record of these stations must be kept. This is vital as during the contest one must know who he can use as a "clear channel" and who to give a wide berth.

After determining your local QRM and competitors you should make available sufficient "bugs" to overcome the problem. The experienced operator should have sufficient quantities available off the shelf. Oh, what is a "bug"? Well it's a device which, when subjected to a RF field, transmits in the frequency range 46-212 MHz, and it is normally thrown into a dense bush adjacent to his aerial. If their XYL does not close them down their neighbours will!

The shack must be placed on full alert immediately prior to the contest and a check list helps in overcoming small items which could be missed. The fridge must be checked (what! all good shacks have a fridge) to ensure sufficient 807's are available. Here again contest experience is vital in knowing the consumption contacts ratio. A good tip is to use cans for contest work as it keeps the operating bench clear of unnecessary glasses; besides cans don't break and can be ejected without fear. Those who require coffee or tea will have to work this situation out for themselves as the writer has a distinct fear of rust! Food — not on. Never eat during contests. You could get caught with your mouth full and miss a vital QSO. However, if you have to indulge, eat only during your CW stint.

Now to the equipment side of things. Remember Mr. Murphy? He nearly always calls during contests. Firstly to your power board. Replace shack fuses with "contest fuses" calculated by using the formulae, expected load current by 10, the figure is in amps.

At the same time similarly wire several other spare fuses and leave in the bottom of the box. Remember to lock your fuse box (if outside), as it has been known to have had an untimely power failure when a local competitor or neighbour delights in a practical joke.

Don't forget to reconnect the high power taps on all transformers previously set for RI's visit, and wind speech processors flat out. Disconnect ALC wiring and TVI filter which all cause losses.

If you are fortunate to have all band coverage and prefer three HF transceivers and separate 6, 2 and 432 MHz equipment for both FM and SSB you are set to go!

Now it's on! For the first couple of hours you are flat out and you will find it difficult to operate more than two rigs. That is to get those initial but so vital VHF/UHF contacts which will from then on be treated on a time basis.

For log-keeping, never use help as they could make a vital mistake which you would never ever make. If you are using the failsafe VK8KK logging system (refer AR December 1963) you have of course set yourself well on the way to success. However, if you are using a microprocessor, remember to change your softwave to adapt to your particular contest. Instant interrogation is vital. This is easily achieved by feeding the output of your CW/ASCII VDU direct into your microprocessor to give instantaneous display of YES/NO, have/have not worked on this band. Unfortunately, on using voice, you have to manually type in his call (VNG and band selection already hard wired).

When contacts start falling away (less than 60 per hour) then this enables you to bring in another rig or two. These of course are fully independent and have their own aerial arrays. Call CQ contest on three rigs on three different bands! Don't forget CW of course (use your programmable keyer) (see VK8KK article AR May 1972). Again experience counts when you get three replies at once. Make the bloke who has the most number of contacts wait. This has been determined earlier as you have dodged working him because of his big score. Most importantly work the station worth the highest points. Tie them all up by acknowledging their calls! Incidentally if you are working an overseas contest and are being swamped by Californian Kilowatts and are in a humorous mood, always pick out the very weakest, give him a 9 + 40 report, and comment on his large signal off his barefoot rig and vertical aerial. Then, when the big Kilowatt bloke next calls, ask for several repeats, give him a 3 x 3 and leave him to look for his fault!! Clears the ether considerably!! Fun if you can spare the time to slip off and listen to the results!

Well, as the contest proceeds and your score mounts, the sorting out of the men from the boys becomes more dramatic. Remember, if you strike a bloke getting close to you, jump a hundred numbers and floor him. He could even give it away in disgust!

Although these predescribed methods are only basic, in fact you could say only for openers, they should however set one on the right track.

Finally, always remember to have built up enough "flexitime" to take the next day off, and don't forget the vital plastic bucket!

And remember it's the **FRIENDLY CONTEST** attitude that counts. ■

VHF-UHF AN EXPANDING WORLD

Eric Jamieson, VK5LP
Forreston. 5233

AMATEUR BAND BEACONS

VK0	VK0MA, Mawson	53.100
VK1	VK1RTA, Canberra	144.475
VK2	VK2WI, Sydney	52.450
	VK2WI, Sydney	144.010
	VK2RHR, Mittagong	144.120
VK3	VK3RTG, Vermont	144.700
VK4	Mt Mowbullan	144.400
	VK4RBB, Brisbane	432.400
VK5	VK5VF, Mt. Lofty	53.000
	VK5VF, Mt. Lofty	144.800
VK6	VK6RTV, Perth	52.300
	VK6RTU, Kalgoorlie	52.350
	VK6RTW, Albany	52.950
	VK6RTW, Albany	144.500
	VK6RTV, Perth	145.000
VK7	VK7RNT, Launceston	52.400
	VK7RTX, Lonah	144.900
	VK7RTW, Lonah	432.475
VK8	VK8VF, Darwin	52.200
JA	JD1YAA, Japan	50.110
HL	HL9WI, South Korea	50.110
KG6	KG6JDX, Guam	50.110
KH6	KH6EQI, Hawaii	50.104
ZL1	ZL1VHF, Auckland	145.100
	ZL1VHW, Waikato *	145.150
	ZL1VHF, Auckland *	433.100
ZL2	ZL2MHF, Upper Hutt	28.170
	ZL2VHP, Manawatu †	52 500
	ZL2VHF, Wellington	145.200
	ZL2VHP, Manawatu *	533 250
	ZL2UHF, Wellington *	433.000
ZL3	ZL3VHF, Christchurch	145.300
ZL4	ZL4VHF, Dunedin	145.400

*** Denotes addition to list.**

† Denotes change of location.

There have been some changes to the beacon listings this month. Firstly, VK4RTL, the Townsville beacon, still continues to be off the air during rebuilding, so I will await word from the TARC that it is operational again before listing. From the 1977 "Break-In" Call Book I have noted some changes to the New Zealand beacon listings, and have added or amended accordingly.

SIX METRES

Those of you who read these columns regularly know how much I have been pushing everyone to become fully operational on six metres for a long time now, and I have always said the frequencies between 47 and 54 MHz will be the ones producing the most surprises during the next few years. So far my predictions have been right on the ball, and with the information I have to present to you this month from several letters received those who are not prepared by September could miss out — and that means a reasonable transmitting power, say 50 to 100 watts of SSB or CW, the best possible receiving set up, and a really good antenna. And there is no point in listening all the time, try some transmitting! Use the 52.050 calling frequency. If you can arrange to have another converter and antenna system to allow coverage from about 47 to 50 MHz you can do some monitoring of northern and north-eastern TV stations' frequencies, some of which were listed in these notes a few months ago. Keep a watchful eye and ear on 28 MHz — when that is full of signals start looking higher. I use a modified VK3 VHF Group 6 metre converter retuned for coverage from 47 to 50 MHz with a 44 MHz crystal fed into a 3 to 6 MHz Command receiver, much modified, to produce good signals on SSB, CW and FM, plus a broadband type of yagi centred on 48.750 MHz. This total combination is far superior to the fairly cheap type of all band radios available which also cover this range, if for no other reason than frequency can be read accurately, and it doesn't drift. This, together with the FT620, which covers 50 to 54 MHz, plus 200 watt linear amplifier if needed, and a wide spaced 6-element yagi, give me a fairly good six metre set-up; one which will be working quite a lot during the equinoxial periods when most such across the equator activity can normally be expected

However, back to the letters. First one from Steve VK3OT, which arrived too late for inclusion last month, but which contains some interesting information. Firstly, in regard to the following repeaters in California, USA, WR7ACC Phoenix, Ariz., WR6AAJ Los Angeles, and WR6AAK California, all on 52.525 FM. WR7ABR Arizona on 53 760 FM and on 53.720 is WR6ADP. WA6JUD is running 2 kW PEP and looking for VK contacts. KM6IAA/DU2 is operational on 50 MHz.

ZL1AA/K Kermadec Is. will be on from October, and Steve is doing what he can to implore the organisers of the visit to take 6 metres. VK9ZM will be QRT from Willis Is. from 30/6/77. VK9JD will be on 6 metres from October, QSL via VK3OT. The beacon on Fiji, 3D3AA will be back on the air before long when the new antenna is installed. TV DX from ZL and VK, in Fiji, is big news and is also being seen in Noumea, reports FK8KAA. YB1AZY, from Australian Volunteers Abroad, is going to try to listen on 6 metres but the band is restricted to Indonesia.

On 24/5 Steve noted long distance DX on 15 metres which was producing back scatter paths, one SW, the other NE from VK. Up to 4 echoes were heard from Joan VK3BJB over 300 miles to north. 7Q7 from Africa was 5 x 9 + + +. At the same time weird telemtery signals were coming in from the west on many frequencies around 50.400 with a multi-channel tone modular carrier on 50.700 A TV FM channel was on 53.780 approximately at 5 x 9 + + + + from West South West. Steve suggests you try Mawali or Zambia which just happens to have a brand new TV station on Channel 1! Time 0700 to 0730Z. (There seems no reason against hearing and perhaps working Africa on 6 metres, it's no further away than the USA . . . 5LP.) Steve is also holding cards for some 50 or so QSO's made by VK stations to YJ8KM. If you want your card write to VK3OT via P.O. Box 414, Hamilton. Incidentally, YJ8KM will be on 6 metres again this year. Good to hear from you, Steve, many thanks.

Geoff VK3AMK sends a letter with news of 6 metres, and many thanks to you for the information. He writes "Two letters from JE1RXJ, first with news of openings from JA to KL7HAM in western Aleutian Islands, being 15/5 0300 to 0400Z, 23/5 0100 to 0300Z, 25/5 0020 to 0030Z. Approximately 130 JA's worked KL7HAM! The second series of openings took place on Sunday morning, 5/6 2150 to 2330Z. Many JA's worked K6DVI, K6JDV, WA6ABH, WA6JRA, WB6ECD/6 and WB6NMT! From my understanding of the propagation between JA and W it is much rarer than for VK to work JA. Almost all previous openings seem to have been either at sunspot cycle peaks or at least during the favourable portions of the cycle.

"During recent months the JA's have worked the following areas: DU, HL, JD1, JD1 (Marcus Is.), K6, KL7, KG6, KG6 (Saipan), KH6, P29, VK, VS6. What a fantastic list! The most obvious and notable exception is ZL. The following are active from DU2 — WA6YOU, K9PNT, KOWIQ and KH6IMH. KL7HAM is said to be leaving KL7 in September or later and shifting to ZL. This is most unfortunate as given good late spring conditions it could have been a possibility to work him from at least northern VK. Great circle distances from here are not greatly in excess of VK-JA. (Whatever the outcome of his move he may promote some 6 metre activity in ZL, which should help . . . 5LP.) The way conditions seem to be improving lately the signs for a bumper DX opening in the near future look really promising. My own experience on 15 metres lately have shown the best conditions there in years."

Graham VK8ZCJ writes from the Darwin area with happenings up there on 6 metres. There seems no doubt we in the south live in the wrong places at times! He tells us:

"JA openings rather scarce at the moment, worked JA6WKI on 19/5 at 1225Z. Other signals were heard but not worked on 18/5, 23/5, 24/5, 26/5, 5/6 and 9/6. On 6/6 and 7/6 both Graham and Brian VK8VV were fortunate to work Lyell VS6BE in Hong Kong. Lyell had read in JA 'CQ' magazine of openings to Australia and began calling CQ on CW with his beam towards VK. Lyell was calling on 50.100 and listening 52 010. On 6/6 we talked for about 1½ hours with his signals peaking to S9. He has worked many JA's and KG6 this year.

"The VS6BE QTH is about 2000 feet a.s.l. and has 360 degrees of clear take off. On 6 metres he runs an FT620B to a 4CX250B linear to an 8 element KLM log periodic antenna. On 2 metres he runs an IC211 to a 300 watt linear, and on 432 he uses a Liner 430 to a separate 300 watt linear!

"The 6 metre allocation in Hong Kong is 50 to 51.500 MHz so to work VS6 we must work split frequency. We suggested to Lyell that he listen on 52.100 to allow us to use the band change switch on the transverters instead of separate receivers. He saw the sense in this and will be calling on 50.1 and listening on 52.1 in future. His second receiver is a 75A4.

"On 7/6 and 8/6 I heard an AM signal on 51.909, it peaked in the direction of Indonesia and turned out to be the 11th harmonic of RRI in Padong on Sumatra operating on 4.719 MHz running 50 kW It is a pity there is no 6 metre activity over that way.

"While talking to Lyell VS6BE he informed me there is no TV in Hong Kong on 51.750 so the station I previously mentioned as coming from there would be in error as to location. However, the TV video on 49.750 still remains a very good indicator of openings to the north." Thanks again for writing, Graham.

My next letter comes from Nev VK4ZNC, and is in a different form from most, and the relevant parts are as follows:

"Most amateurs who have 6 metres would be keen to work a new country. Most were surprised and pleased to work Ken YJ8KM last year. I wondered why we haven't heard from some other countries in the Pacific in the range of Es, so decided to write to Jean FK8AB in New Caledonia, who I had heard had 6 metre gear back in 1967. Since then a cyclone had destroyed his equipment. If some new equipment could be provided for Jean I am sure he would come back on the 6 metre band.

"I wonder if there are enough keen 6 metre operators around VK to perhaps donate a small amount each to buy Jean an IC502? Forty stations each donating $5 would buy one. I would be prepared to build him a 6/40 linear to tack on the IC502. Perhaps someone might like to loan their 6 metre SSB rig for the next season. I believe the only way YJ8KM got on 52 MHz was because some generous VK2 donated or loaned him an FT650 transverter.

"Well, Eric, I hope the VHF amateurs of Australia are as keen as I am to work another country on 6 metres. Jean tells me that none of the other amateurs in his country are really interested in the band, so he is our only chance." It's over to you, chaps, what can we do to help? If you care to write, send to Nev Cooper VK4ZNC, 5 Cahill Street, Strathpine, Qld., 4500.

Incidentally, just a few lines from the letter Jean FK8AB wrote to Nev He mentions the 2 metre band is very popular in New Caledonia, many using IC202's and some with 6/40 linears! Jean says he will try to arouse Vincent FK8BI and Felix FK8AC to also try 6 metres. Felix is very active on 144 via satellites

To change the subject a little, I had a phone call from Graham VK5GW recently, and he advised that Ed VK8ZER/6 (also known as VK8NER/6) will be spending six months from 27-6-77 at the Giles Weather Station, c/- PMB., PO, Alice Springs, NT. He proposes operating on 6 metres SSB on 52.050 using an FT650B plus his FT101B, to a 5 el. beam. He will also operate 52.525 FM. On 2 metres he will use an FT221 and calling on 144.1. He will use a KLM 160 watt linear to a 20 element cross polarised yagi, and will operate on all FM channels, but giving preference to Ch. 50. On 432 MHz he will be using a 16 el. long yagi. He has the equipment capability for both Oscar 6 and 7.

To give you a chance to see if he is around, he will be using his N call as well, and will operate on 3569, 3575, 21150, 21175, 21195, and Ch. 14 on 27125 LSB. He has an 80 to 10 metre trap vertical and a 10 to 30 MHz log periodic!

It looks as though Ed means business. As most of the usual activities associated with more

civilized areas will be missing at Giles, no doubt Ed will be on the air quite a lot when not at work. The distance to VK5 is between 700 and 800 miles, a not impossible distance for 144 MHz. It is rather unfortunate for all those people still waiting for a VK8 for Worked All States on 144 MHz that Giles is in Western Australia! About the best we can suggest is for Ed to gather up his gear on Sunday afternoons and travel the 50 or so miles to the border with the Northern Territory and operate from there! Whatever happens, I do hope contacts will be made with Ed after all the trouble he has been to to take so much equipment with him. My suggestions would be to look for him on 80 metres and then try the VHF bands with him; if you know he is at the other end listening or transmitting that's a start in the right direction.

I have had a letter from Winston VK7EM who indicates he is very interested in the idea of an HF net to promote VHF activity. He suggests around 3520 or the low end of 14 MHz. Additionally, he will be active on 1296.1 for the first time, on AM, CW or FM; also on 435 MHz FM, 432 MHz tuneable, as well as 426 MHz ATV! So naturally Winston is looking for skeds with others with similar interests and would like to hear from you. He makes a suggestion that during evenings of good tropospheric openings that there be a back up HF channel available, preferably on 80 metres but also perhaps 20 metres, where one could call and activate some other stations, e.g. if you are in the shack you could be monitoring one of these special frequencies. That's a further thought. Thanks for at least writing, Winston, that's a lot more than everyone else seems to have done!

Lyle VK2ALU writes his Moonbounce report in "The Propagator" of June, 1977, as follows.

The scheduled EME tests for May were carried out in pouring rain on 28/5. The quantity of water on the ground almost made it seem like a maritime-mobile operation, with Charlie VK2ZEN having quite a damp few hours attending the dish.

"First time contacts were made with K9AQP/1, M/O copy and then with K3NSS, who uses an 85 foot dish, at 11 dB and more on peaks, allowing 5 x 9 reports to be exchanged. However, the strength dropped for some reason to approximately 6 dB above noise. They are certainly not obtaining results which could be expected from a dish of this size.

"A half hour VK2AMW CQ period then followed, during which we were called by a station which was almost certainly W7GBI. T reports were exchanged but no contact resulted.

"As there is no other VK station on 432 MHz EME yet and we are not allowed to transmit with the dish pointing lower than 10 degrees above the horizon, the only way to make our 70 cm band WAC was to arrange a low power scheduled test with VK2AYF, some 8 miles distant! Local reflections from side lobes radiated from the dish were used.

"VK2AYF is the only station, apart from VK2ALU, who operates on 70 cm in the Wollongong area, so this contact doubled his score! As Stuart is leaving Wollongong this month to live in Sydney, VK2AMW had to get in quick to catch him. At the present rate of amateur activity on the UHF bands in Wollongong, the CB-ers will be showing us the way!"

As a matter of further interest, Lyle VK2ALU has been putting RTTY into Oscar 7 Mode B to try out equipment capabilities. Anyone interested in trying to make a contact in this mode?

I have received a letter from Bill Tynan W3XO, the Contributing Editor for the QST "The World Above 50 MHz", who questions his listing of the 70 cm record of K4NTD to K5LLL, as he had heard about the 1516 mile contact between Les VK3ZBJ and Wally VK6WG. I did some stirring in this column recently about you two guys getting on the job and claiming the record — you don't deserve it if you don't complete the deal! Bill also asks about the 1296 MHz record as he had also heard about the record contact between Reg VK5QR and Wally VK6WG. That's another one for you to seek, Wally.

Bill W3XO also asks for advice to be sent to him direct of any noteworthy VHF/UHF happenings in this part of the globe. This I will do, as he points out that by the time I write the information in AR, and the copy finally gets to the USA, and he gets it into the columns of QST, almost a year has elapsed, so we will both try and shorten this time for noteworthy happenings. With the co-operation of all you good people who write to me I am sure we can speed the messages around the globe when we do something special, like working Africa on 6 metres!

Well, we haven't touched very much on other activity this month, mainly because there hasn't been a lot. But not let us worry, there is always next month, and another equinoxial period will soon be here and so will the long distance 6 metre DX!

Closing with the thought for the month: "Those girls who burned their bras are in for a shock when they decide to start wearing them again. It's like finding another job after retirement: they'll be doing the same thing, but at a lower level!"

The Voice in the Hills. ■

ATV NEWS

KEVIN CALLAGHAN VK3ZVJ
PETER COSSINS VK3BFG

Since our first report, the ATV activity has really started to increase, with the addition of about another 15 stations in the receive mode. Of these about six are building transmitters. This is only in VK3; what is happening elswhere?

The VK3 liaison channel is really starting to get cluttered. How about using it as a calling and listening channel and using the secondary frequency for those crossband QSO's.

REPEATER PROJECTS

The VK5 group is well and truly into their project. Equipment is being built now that they have standardised all of their boards, connections, and other constructional techniques. We hope to have a report first hand from VK5 in the near future. There is a fairly close liaison between the VK5 group and the VK3 group, and ATV points are discussed on the 40m net between VK5KG and VK3AHJ every Sunday morning after the VK3 WIA broadcast. John and Ron would welcome any VK's from interstate or intrastate to join in and let us know what is happening in their particular areas.

The VK3 repeater project is fairly quiet at the moment due to some of the key members being tied up with pressing local problems. The application for a licence has been lodged and the site for the repeater has been authorised in a very select position on Mt. Dandenong. The receiving and transmitting aerial patterns have yet to be finalised and we would appreciate any feedback from Gippsland as to the need to cover this area.

GENERAL ACTIVITY

Mt. Gambier is to have its own ATV activity as VK5TH is setting himself up with a receiving and transmitting set-up using the VK3 frequencies. We will be looking forward to seeing pictures from that area. Once there is one station on in a particular area, more will follow. Ray VK3ATN, in Birchip, is also setting up his station to get pictures to and from Melbourne. Winston VK7EM is already on 1296 MHz and will be trying to get pictures into Melbourne on that band.

The only information that we have been able to extract from VK2 was from Pierce Healy VK2APQ, who advises that Sydney has very little ATV activity, if any. There is some activity in the Gosford area associated with the Central Coast Amateur Radio Club, but we are unable to provide any more information than that.

We received a note from far Northern Queensland about some interest in starting some activity and that is the only information that we have received at all from VK4.

Electronic call sign generators and video typewriters have been under construction during the last few weeks and some very nice results have appeared on our screens. Some TV game colouriser kits have been brought into action giving good effects. I have designed a call sign generator which gives two lines of information. There are six characters in each line so you can have a call sign and a location or a Christian name. If anyone wants more information on this, please send a SAE to —

Kevin Callaghan,
34 Gordon Grove, East Preston,
Victoria, 3072.

A more elaborate generator, with many lines of information, has been designed by John VK3ZTO. His design details will be available at an early date. The new FET oscillator as described in last month's column to replace the BF180 oscillator in the VK2ZIM ATV converter has been incorporated in a brand new converter design using FET's and having a better noise figure than the current standard. More importantly, it does not suffer from any cross-modulation problems that the current models are prone to. Details for this converter design plus a PCB designed for the job can be obtained from Les Jenkins VK3ZBJ.

A SAE to his address as per the call book will get you more information and prices of the various units. He also has a pre-amp design for the very serious ATV DX-ers or even just 70 cm operators. This uses a fairly expensive FET and when set up correctly will give a noise figure of around 1 dB. Yes, that figure is correct! The pre-amp can be purchased from Les all set up if sufficient people are interested to make a bulk buy of the special FET. The more people purchasing, obviously the cheaper will be the units.

To round off this month's news, I am putting out another appeal for news from all ATV groups around Australia. Please write to Peter Cossins VK3BFG or myself Kevin Callaghan VK3ZVJ. Peter's address is in the call book and mine is published in this column.

What are your thoughts about an ATV convention? This has been mentioned by a number of ATV-ers. Sounds good. What are your comments on where and when?

INTRUDER WATCH

Alf Chandler, VK3LC

As I shall be overseas until late December this year, all Co-ordinators please note that reports are to be forwarded to Ivor Stafford VK3XB, 16 Byron Street, Box Hill South, 3128, until January next year, when I shall resume my responsibilities as Federal Co-ordinator.

For our information ARRL has forwarded to me some copies of FCC complaints as issued to offending countries, and one such is here reproduced:—

From — Federal Communications Commission.
Action ETAT. March 1977.
Name — DRSPALT: MVB/I & OD: E.
To — CENTEL, CAIRO.

32008 Radio Cairo 7050 and 7075 kilohertz reported causing daily harmful interference to amateur service generally 1700 to 0600 GMT Stop Request USCAN 115 assistance regards.

FEDCOMCOM.

Thus, our contemporaries in the USA are doing their best to rid our bands, with the help of our Administration and Intruder Watchers as well as their own Observers. See you next year. ■

IARU NEWS

WARC 79

Perhaps the main international news this month is that Article 41 of the International Radio Regulations has been included in the agenda. Details of the contents of this Article, which set the operating regulations, will be found in IARU News on page 20 of AR May 1976. The implications of this will be discussed at the IARU IWG meeting in the UK late June.

Meanwhile the FCC in the USA has released its fifth Notice of Inquiry which could well be the last opportunity amateurs in the USA will have to respond to the Commission's proposals for WARC 79. The latest proposals reflect some changes from the 3rd NOI in docket 20271; for example the 40m band now proposed is 6.95 to 7.25 MHz on an exclusive basis. Amateur proposals for new bands about 10, 18 and 25 MHz (see AR July 1975, p. 28) were accepted only insofar as 25.76-25.86 MHz was proposed as an exclusive amateur band.

The ARRL in response to the 3rd NOI stated there existed a vast gulf between the 7 MHz and 14 MHz amateur allocations which makes it extremely difficult for a low-power service to meet its long distance communications needs on a reliable basis in the face of widely varying propagation conditions.

In West Germany DARC reports quite good relations with their Administration. One proposal envisaged the addition of 10 kHz to the lower limits of the 3.5, 7 and 14 MHz amateur bands with the intention of granting priority to amateur emergency traffic, especially rescue operations. All the proposals go forward to the CEPT (the permanent organisation consisting of 26 European telecoms administrations) for comparison purposes at their meeting in mid-June.

The WIA voted in favour of the admission to IRAU membership of the amateur radio societies of Turkey, Papua New Guinea, Jordan and Oman. In regard to Turkey the TRAC reported that, although amateur licences are not presently being issued by the government it is hoped that their national Parliament will resolve this shortly. The Jordanian application said that since the Society (RJRAS) is officially sponsored by the King of Jordan the Society acts as the licensing authority, and it is therefore "naturally inclined very favourably" toward amateur radio in Jordan. ■

AWARDS COLUMN

Brian Austin, VK5CA
P.O. Box 7A, Crafers SA, 5152

RUBENS AWARD — BELGIUM

Belgium is celebrating the anniversary of Pieter Paul Rubens, one of the famous painters in the history of that country.

The Antwerp Radio Amateurs have an active part in this celebration. On the occasion of this anniversary the Antwerp sections of the UBA uses a special QSL card, and also issue the Rubens award, during the period 1st July till 30th September.

Required number of contacts with stations in the Province of Antwerp are as follows:

1. For the first time: 40 QSL's via Antwerp repeater ON0AN on 2m FM 145.800-145.200 MHz.
2. Belgian stations: 20 QSL's directly.
3. Frontier countries (PA0-DL-LX-F-G): 10 QSL's directly.
4. Other European stations: 6 QSL's directly.
5. DX stations: 3 QSL's directly.

PHONE, CW, OR MIXED, ALL BANDS.

This award is also available to any SWL.

Five IRC's, and extracts of logs, certified by two other amateurs, should be sent to —

Belgium Amateur Radio Station ON6KC,
Van Riet Robert,
Beukenhofstraat 47,
B 2060 Merksem.

WAP AWARD — NEW ZEALAND

General —

1. The award is available to licensed amateurs and shortwave listeners (on a "heard" basis).
2. Contacts after November 1945 are valid.
3. Do not send QSL cards. A list showing full details of the contacts should be certified by the Awards Manager of a National Society.
4. Certificates will be endorsed for various bands and modes provided the necessary proof is submitted.
5. There is no fee for the award. It is suggested that 2 or 3 IRC be sent to help defray expenses.
6. The address for applications is —

NZART,
Wellington, New Zealand.
Post Box 489,

Requirements: Confirmed contacts are required with 30 of the listed Oceania "countries".

List of Countries:

C21/VK9—Nauru Is.
CR8/CR10 -Timor.
DU—Philippines.
FB8—Adelie Land.
FK8—New Caledonia.
FO8—French Oceania.
FW8—Wallis Island.
FU8/YJ—New Hebrides.
JD—Ogasawara Is.
JD—Minami Torishima.
KB6—Baker, Howland, Phoenix.
KC6—East Carolines.
KC6—West Carolines.
KG6 -Maroanas Is.
KG6—Guam.
KH6—Hawaiian Is.
KJ6 -Johnston Is.
KM6—Midway Is.
KP6—Palmyra Is.
KS6—Am Samoa.
KW6—Wake Is.
KX6—Marshall Is.
PK YB 8F—Java.
PK YB 8F—Sumatra.
PK YB 8F—Borneo.
PK YB 8F—Celebes.
PK YB 8F—West Irian.
VK—Australia.
VK2—Lord Howe Is.
VK4—Willis Is.
VK0—Macquarie Is.
VK9 (P2)—New Guinea.
VK9—Norfolk Is.
VK9 (P2)—Papua.
VK9 -Christmas Is. (ZC5).
VK9—Cocos Is. (ZC2).
VR1—Gilbert Is.
VR1—Ellice Is.
VR1—Br Phoenix Is.
VR2/3D2—Fiji Is.
VR3—Fanning and Washington.
VF4—Solomon Is.
VR5/A3—Tonga.
VF6—Pitcairn Is.
VS4—Sarawak (9M8).
VS5—Brunei (9M).
ZC3—North Borneo (9M6).
ZK1—Northern Cook Is.
ZK1—Southern Cook. Is.
5W1—Samao (ZM6).
ZM7—Tokelau Is.
ZL/K—Kermadec Is.
ZK2—Niue
ZL—New Zealand.
ZL/C—Chatham Is.
ZL/A—Auckland and Campbell Is.
ZL5—Antarctica. ■

LARA

Ladies Amateur Radio Association

This month we start with a report of the LARA (VK3) meeting held in June. At this meeting the LARA Reporter saw no less than six licensed YL's sitting along one wall. A photograph was duly taken to commemorate this event, and a caption would have read: Mavis VK3KS, Mavis 3BIR, Norma 3AYL, Heather Bedson (YF/VK3ZEB), Heather Mitchell (call sign pending), Rhonda VK3ZYL and Vicky Edmonds (also awaiting a call sign). Other partially qualified, or not-yet-qualified, members were present, of course, and to even things up, there were six gentlemen (associate members) present. Items included on the agenda for this meeting were (in order of importance): lunch, followed by the opening of the meeting, discussion of money (which is looking good at last) and discussion of the birthday party (July 30th-31st), and the All-Australian Z/L sked.

A point raised at this meeting was the suggestion that there should be a roster for the position of Net Controller for the sked. Myrna VK5YW, who has been doing a wonderful job as the net controller, now feels that other YL's should perhaps have a go. All suggestions and volunteers welcome. By the time this issue goes to press we will have held the special birthday sked, where we hope YL's all over Australia will come up on air (with their own stations **or** as guests on other stations, as the regulations allow) to meet other YL's and join in the chat.

Our special feature for this month's news concerns a very interesting family. Brenda and John Edmonds (VK3KT and VK3AFU) have four recently qualified amateurs in their family. Vicky and Charles have both passed the AOLCP and Brenda, Junior, and Alex have become Novices. Six licences in all (two in each category), and three of these belonging to the YL members of the family. With so many active amateurs in one place the shack is certainly going to get crowded! Anyway, best of luck to this talented family. ■

CONTESTS

Kevin Phillips, VK3AUQ
Box 67, East Melbourne, 3002

CONTEST CALENDAR

August	
6/7	Romanian Contest
13/14	REMEMBRANCE DAY CONTEST
13/14	European CW contest
20/21	RAST SEANET WW DX Phone Contest
20/21	SARTG RTTY Contest
27/28	All Asian CW Contest
September	
10/11	European Phone Contest
10/11	Albatross SSTV Contest
17/18	Scandinavian CW Contest
24/25	Scandinavian Phone Contest
October	
1/2	VK/ZL/Oceania Phone Contest
8/9	VK/ZL/Oceania CW Contest
15/16	Manitoba QSO Party
15/16	RSGB 7 MHz Phone
29/30	CQ WW DX Phone Contest
November	
5/6	RSGB 7 MHz CW Contest
12/13	European RTTY Contest
19/20	WWDXA CW Contest
26/27	CQ WW DX CW Contest

RD CONTEST

This contest is on again on August 13 and 14. This is the contest where many old friends can be met on air and many more made. There have been a few changes made to the rules, which should close the big gap in trophy points scored by the Divisions. No Division can win without individuals participating though, and also submitting logs. Last year we had a record number of logs, and with a small amount of extra effort, a new record could be set this year.

BARTG SPRING RTTY CONTEST

Results have come out, and show in 58th place VK2SG with 54.318 points, VK3KF 68th with 38,080, and VK5WV with 18.420 in 89th place.

ALBATROSS SSTV CONTEST

Two periods, 1500 to 2200 GMT on Saturday, September 10, and 0700 to 1400 GMT on Sunday, September 11. Exchange picture with call sign, signal report and contact number. Score 1 point for contacts on 14 MHz, 5 points on other bands and 25 points via Oscar. Multipliers are 5 for each country and 10 for each continent worked. W/K and VE call areas are considered as separate countries for scoring. Final score is total exchange points times the sum of multipliers (counted once only). Frequencies are 3754, 7040, 14230, 21340, 28670.

Logs must be received no later than October 30th and go to Prof. Franco Fanti I4LCF, via Dallolio n 19, Bologna 40138, Italy. Include a dollar or equivalent to cover mailing expenses for copy of results and future contest information. ■

MAGAZINE INDEX

Syd Clark, VK3ASC

BREAK-IN April 1977

Some Ideas for Home Brewing; Printed Circuits the Easy Way; The Quick Brown Fox Generator; Some Modifications to the Wellington Branch Direct Conversion Receiver; How Flat is NZ.

From the large range of Yaesu Measuring Equipment comes the YC-500 series Frequency Counters

● 500MHz Frequency Counter

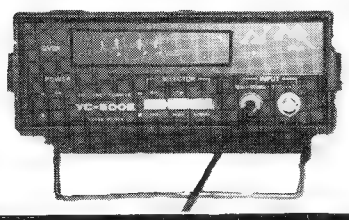
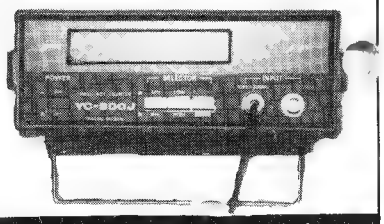
The YC500 series is designed for the discriminating Amateur-Experimenter who desires accuracy at an affordable price The YC-500E can provide 0.02 ppm (±1 count) (YC-500S 1 ppm & YC-500J 10 ppm) accuracy (using a dual range 6 digit readout) up to 500 Mhz, with readout in kHz or MHz, selectable with a front panel switch.
Compact and extremely flexible in application, the unit is complete with easy to read display The unit will function on 234V AC 50Hz for bench use, or on 12V DC. Double sided glass epoxy circuit design assures stable and reliable operation for many years to come. A "must" item for 144, 450 MHz operators!

TECHNICAL DATA

Frequency Range:
Input 1 — 10 Hz to 50 MHz;
Input 2 — 50 MHz to 500 MHz.
Accuracy:
YC-500-E model — 0.02 PPM;
YC-500-S model — 1 PPM;
YC-500-J model — 10 PPM.
Display Digit: 6 digits.
Display Time:
0 1 or 2 seconds.
Counting Time: 0 001 or 1 second
Input Voltage:
Input 1 — 25 mV to 20 V RMS;
Input 2 — 100 mV to 2 V RMS.
Input Impedance:
Input 1 — HIGH 1 Meg, LOW 50 ohms.
Input 2 – 50 ohms
Input Capacitance:
Input 1 — Less than 20 PF;
Input 2 — Less than 20 PF.
Operating Temperature: 0 to 40°C
Power Requirement:
AC — 100/110/117/200/220/234 V;
AC, 50/60 Hz;
DC — 12 to 14 5 volts
Size: 220(W) x 80(H) x 235(D) m/m
Weight: Approx. 3.2 kg.

PRICES

YC-500E	$574
YC-500S	$446
YC-500J	$319

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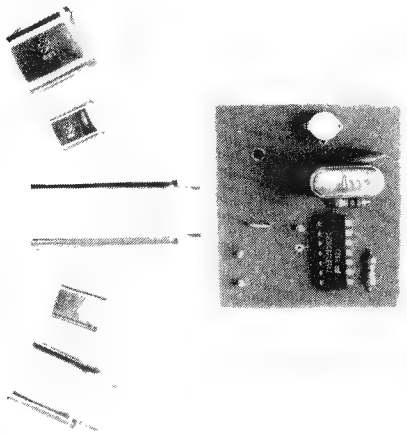

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- 5-EL 28-30 10 Metre $160
- 6-EL 28-30 10 Metre $200

TRAPLESS TRIBANDER

- 7-EL 10-30 Log Periodic $525

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HAM RADIO March 1977
IF Amplifier Design; Improved Digital AFSK; Reducing International Distortion in High-Frequency Receivers; Second Generation IC Voltage Regulators; The Polarization Diplexer—A Polaplexer; 24 Hour Clock with Digital Readout and Line Frequency Time Base; Audible S-Meter for Repeaters; Function/Units Indicator Using LED Displays; Control Function Decoder; Synthesized Channel Scanning; Improved Method for Calibrating Time-Base Oscillators.

QST April 1977
The VHF Quagi; Some Basic Antenna Information; Broadband Steerable Phased Array; A Multi-Band Vertical Radiator; Quad Log-Periodic Fixed-Beam Antennas; Sweep 6 Metres and Really Clean Up; Build This C-T Quad Beam for Reduced Size; The Inverted-L Antenna; A Two-Metre J Antenna; Efficient Short Radiators; My Feedline Tunes My Antenna; Build This Quickie Pre-Amp; Solid-Tubes—A New Life for Old Designs; Getting to Know OSCAR from the Ground Up; Amplifiers, Type Acceptance—FCC's Latest Proposals; ARRL Responds to FCC Frequency Proposals; Demise of the Computer Kid; We Want You at the National.

RADIO ZS March 1977
The Ugly Duckling; Digital Receiver Dial.

73 February 1977
Give that Professional Look to Your Home Brew Equipment; You Already Have an Atomic Frequency Standard; Give the Hamburglar Heart Failure; Contest Special Keyer; The Chintzy 12; You Can Sound Better with Speech Pre-emphasis; Are You Really Insured?; Gettting a Patent—Is It Really Worthwhile; Keeping the Wind Down; SSB: The Third Method; The TTL One-Shot; DVM's Get Simpler and Simpler; Instant PC Boards; Computerised Satellite Tracking; Building the Polymorphics Video Board; RTTY Goes Modern; How to Use Those Old Teletypes; Drive More Safely with a Mobile Dialler; An Automatic BC Squelch; Tune Up a Random Wire.

73 March 1977
Pitcairn Island; How Do You Use IC's?; Super Low Voltage Power Supply; QLF Not with the Great Lakes Sideswiper; The Capacitor Comparator; Logical Storage for Logic; CB Can Do Some Things Better; A New Breed of Voltage Regulators; High Quality Displays; Save Time with the Micro OS; PROM Message Generator for RTTY; FCC Approved Microprocessor; How Computer IC's Work; Inexpensive Variable DC Supply; The History of Ham Radio; Remember the Windom; The Agonies of Tower Raising; The Speedy Audio Counter; Versatility Plus for the HW-202; The Boomless Microbeam; Making Your Own PC Boards: Announcing the PCF; Build Your Own Car Regulator; The Happy Flyers; 10 and 11 Metre Predictions. ■

QSP

JUST BELONG —

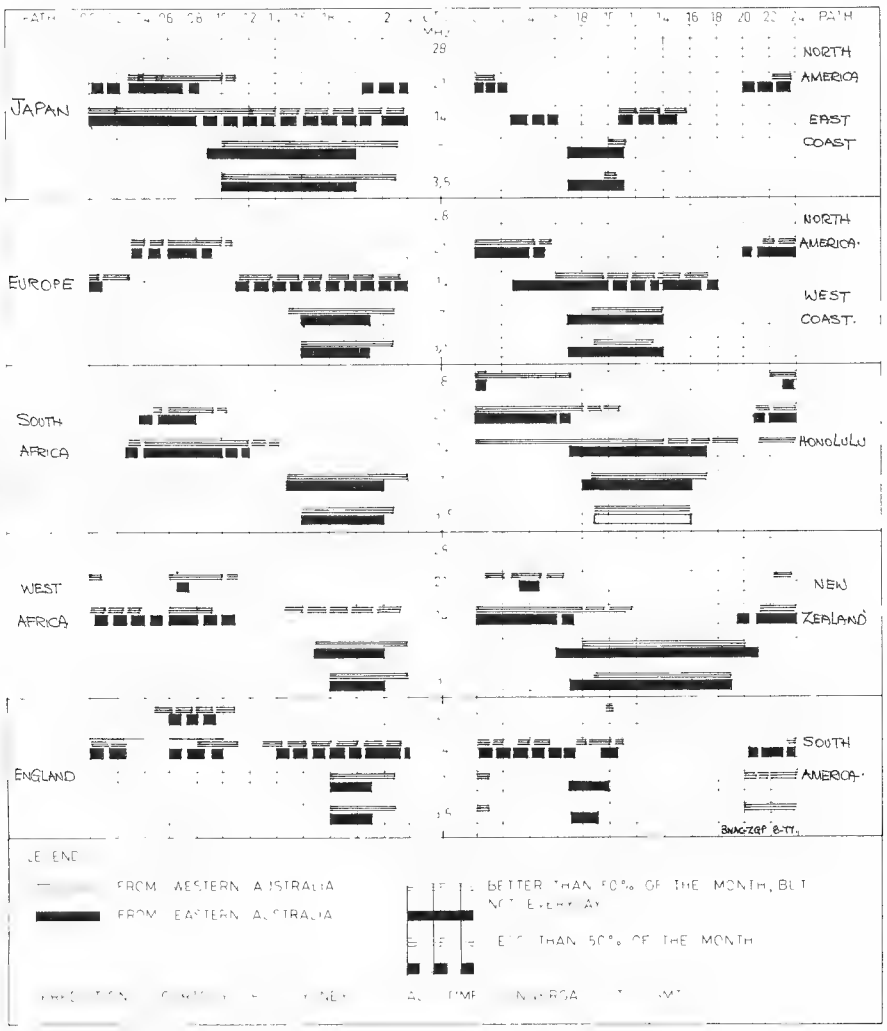
Are you an active member, the kind that would be missed —
Or are you just contented that your name is on the list?
Do you attend the meetings and mingle with the flock —
Or do you stay at home and criticize and knock?
Do you take an active part to help the work along —
Or are you satisfied to be the kind that "Just Belong"?
Do you ever go to visit a member who is sick —
Or leave the work to just a few and talk about the clique?
We have some serious problems that I'm sure you've heard about —
And we'll appreciate it if you, too, will come and help us out.
So come to the meetings often and help with hand and heart
Don't just be a member, but take an active part.
Think this over, remember you know right from wrong,
Are you an active member, or do you "Just Belong"?

From QTC July 1977.

IONOSPHERIC PREDICTIONS

Len Poynter, VK3ZGP/NAC

It has now been confirmed that the running smooth sunspot number reached the minimum in July 1976. This, of course, is a mathematically smoothed figure and it is still too early to be certain. If it is correct then it seems probable that the next maxima will occur in the early 1980s with the swag of predictions that I have mentioned earlier.



The new cycle will start slowly, but after the first few months the general pattern should change. The amount of solar radiation should increase with a corresponding increase in the density of the ionosation of the ionosphere. The 27 day recurrent magnetic and ionospheric disturbances which have been of major importance to HF communications over the last few years will become less noticeable and the shorter more severe storms associated with active sunspots and solar flares will occur more frequently along with daylight fadeouts which have been rare during the last few years.

Predictions for the various paths will start to show more predictability and the conditions will exist for a greater proportion of the month than has been in the past few years.

Already evidence is sufficient to show the increased ionisation with good openings occurring across long daylight paths on 10 and 15 metres. The recurring storms barely affect conditions for more than 24 hours and then bounce back very quickly.

The 2800 MHz solar flux figures are showing pronounced rises evident of the increased solar activity — at the time of writing over 110 with WWV giving solar activity as moderate, as distinct from very low or low. A decided change to the usual — for so long the pattern.

My records show a steady rise in the solar flux over the past three months and augers well for some interesting conditions during and past the September equinoxial period. With as much as a 25 30 per cent increase possible in conditions since last September, some good DX is being worked on the higher frequency bands.

From reports 6m is getting a share of the DX with trans-pacific openings East-West and over the North-South American paths. I venture to suggest by September the new cycle should be showing plenty of activity which will put many into areas they have not worked for considerable periods of time. Long path openings on 15m into Europe are quite good before noon EAST. Even the novices are getting their share of the DX. Conditions to North and Central America are quite good around noon almost daily.

Predictions of the running smoothed number to come are at May 31, 1977, Sept. 21, Oct. 23, Nov. 24.

Monthly means 3/77 — 8.0, 4/77 — 13.2, 5/77 — 18.4

Running smoothed number 7/76 — 12.9 8/76 — 14, 9/76 14.2, 10/76 — 13.4, 77/76 = 13.4

Sunspot data courtesy Dr. Waldmeier, Swiss Federal Observatory, Zurich.
Prediction data: IPS, Sydney. ■

R.H. Cunningham Pty. Ltd.

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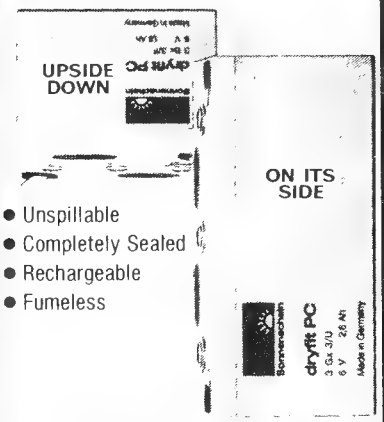

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1 a Multi 7 VHF 2m transceiver, 146 148MHz in 23 channels 10 watt output, 1uV sensitivity. Supplied with one free set of rocks on ch 40.

2 a combined 2 & 6 metre whip antenna (1/4 on 6 & 5/8 on 2) Normally sells for $22.50
Cat D-4620

3 a magnetic mobile base to suit above antenna, complete with lead assy. Normally sells for $25.00.
Cat D-4622

All this for an amazing $189,00.
You save over $47.00 on this package deal!
Limited stock – never to be repeated offer.

Cat. D-3007 with extras!

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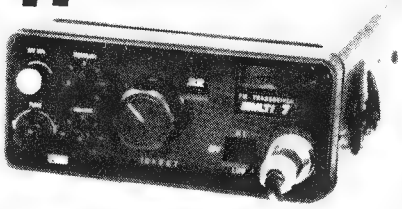

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Cat D-4030 .. .. save $2.60 .. .. $7.90
Scalar base, type MB
Cat. D-4055 .. .. save $1.50 .. .. $3.50
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Cat. D-4610 .. .. save $4.00 .. .. $4.50
RAK 2m antenna, type 82S, 5/8 wave.
Cat. D 4611 .. .. save $5.75 .. . $5.75
RAK 6m antenna, type 46S, 1/4 wave
Cat. D-4614 .. .. save $5.74 .. . $5.75
GA6020 antenna, 6 & 2 metres.
Cat. D-4620 .. .. save $10.00 .. . $12.50
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Cat. D-4622 .. .. save $10.00 .. .$15.00
Antenna lead assembly.
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Cat. D-3010 .. .. save $210.00 .. $375.00

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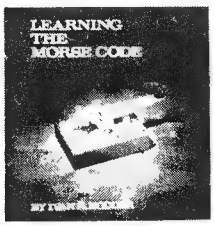

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PROJECT AUSTRALIS

Bob Arnold
VK3ZBB

For several years Dave Hull VK3DZH has ably filled the office of Chairman of Project Australis and operated the Australian command station for Oscar 6 and 7.

With two more satellites envisaged in the near future, Dave's command role will become more exacting and consequently I have agreed to assist with Australis administration.

Therefore, I shall be your scribe and I look forward to receiving news for publication from my many Oscar friends.

Activity on Oscar 7 Mode B continues at a high level with the following new stations being heard:

VK2ZFX, ALU, ZXL
VK3ACR, ATN
VK4ZRF
VK6ZKO.

It is particularly pleasing to see Ray VK3ATN on this mode — his 16 ft EME dish has already enabled him to work JR6AE in Okinawa.

Steve KH6IHP, in Hawaii, is conducting high power tests on Mode B in the hope of working VK and ZL areas. He has already been heard on CW and SSB by ZL3AR.

The next tests will be for a few minutes after the following equator crossings —

Date	Time	Orbit
2 Aug.	0842Z	12411
4 Aug.	0836Z	12436
6 Aug.	0830Z	12461
8 Aug.	0823Z	12486
7 Sep.	0843Z	12862
9 Sep.	0836Z	12887
11 Sep.	0830Z	12912
13 Sep.	0824Z	12937
15 Sep.	0817Z	12962

Please let me have any reception reports.

Unfortunately Oscar 6 is now very sick due to battery failure and it is switched off for the present (June) to give it a chance to revive.

Graham VK5EU has been portable in VK2 for several months using low power and simple antenna systems. His fine signals via Mode B demonstrate what can be achieved with basic equipment.

AUGUST 1977

OSCAR 6				OSCAR 7			
Date	Orbit No.	Time Z	Long °W	Date	Orbit No.	Time	Long °W
1	21919	01.54	91.00	1	12394	00.08	56.12
2	21931	00.54	76.00	2	12407	01.03	69.74
3	21944	01.49	89.75	3	12419	00.02	54.62
4	21956	00.48	74.75	4	12432	00.56	68.24
5	21969	01.43	88.50	5	12445	01.51	81.86
6	21981	00.43	73.50	6	12457	00.50	66.74
7	21994	01.38	87.25	7	12470	01.44	80.36
8	22006	00.38	72.25	8	12482	00.43	65.24
9	22019	01.33	86.00	9	12495	01.38	78.86
10	22031	00.33	71.00	10	12507	00.37	63.74
11	22044	01.28	84.75	11	12520	01.31	77.36
12	22056	00.28	69.75	12	12532	00.31	62.24
13	22069	01.23	83.50	13	12545	01.25	75.86
14	22081	00.23	68.50	14	12557	00.24	60.74
15	22094	01.18	82.25	15	12570	01.19	74.36
16	22106	00.18	67.25	16	12582	00.18	59.24
17	22119	01.13	81.00	17	12595	01.12	72.86
18	22131	00.12	66.00	18	12607	00.11	57.74
19	22144	01.07	79.75	19	12620	01.06	71.36
20	22156	00.07	64.75	20	12632	00.05	56.24
21	22169	01.02	78.50	21	12645	00.59	69.86
22	22181	00.02	63.50	22	12658	01.54	83.48
23	22194	00.57	77,25	23	12670	00.53	68.36
24	22207	01.52	91.00	24	12683	01.47	81.98
25	22219	00.52	76.00	25	12695	00.47	66.86
26	22232	01.47	89.75	26	12708	01.41	80.48
27	22244	00.47	74.75	27	12720	00.40	65.36
28	22257	01.42	88.50	28	12733	01.34	78.98
29	22269	00.42	73.50	29	12745	00.34	63.86
30	22282	01.37	87.25	30	12758	01.28	77.48
31	22294	00.36	72.25	31	12770	00.27	62.36

SEPTEMBER 1977

1	22307	01.32	86.05	1	12783	01.22	74.81
2	22319	00.31	71.05	2	12795	00.21	59.69
3	22332	01.26	84.80	3	12808	01.16	73.31
4	22344	00.26	69.80	4	12820	00.15	58.19
5	22357	01.21	83.55	5	12833	01.09	71.81
6	22369	00.21	68.55	6	12845	00.09	56.69
7	22382	01.16	82.30	7	12858	01.03	70.31
8	22394	00.16	67.30	8	12870	00.02	55.19
9	22407	01.11	81.05	9	12883	00.56	68.81
10	22419	00.11	66.05	10	12896	01.51	82.43
11	22432	01.06	79.80	11	12908	00.50	67.31
12	22444	00.06	64.80	12	12921	01.44	80.93
13	22457	01.01	78.55	13	12933	00.44	65.81
14	22469	00.01	63.55	14	12946	01.38	79.43
15	22482	00.55	77.30	15	12958	00.37	64.31
16	22495	01.50	91.05	16	12971	01.32	77.93
17	22507	00.50	76.05	17	12983	00.31	62.81
18	22520	01.45	89.80	18	12996	01.25	76.43
19	22532	00.45	74.80	19	13008	00.24	61.31
20	22545	01.40	88.55	20	13021	01.19	74.93
21	22557	00.40	73.55	21	13033	00.18	59.81
22	22570	01.35	87.30	22	13046	01.12	73.43
23	22582	00.35	72.30	23	13058	00.12	58.31
24	22595	01.30	86.05	24	13071	01.06	71.93
25	22607	00.30	71.05	25	13083	00.05	56.81
26	22620	01.25	84.80	26	13096	01.00	70.43
27	22632	00.25	69.80	27	13109	01.54	84.05
28	22645	01.20	83.55	28	13121	00.53	68.93
29	22657	00.19	68.55	29	13134	01.47	82.55
30	22670	01.14	82.30	30	13146	00.47	67.43

■

LETTERS TO THE EDITOR

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the publishers.

The Editor,
Dear Sir,
In recent weeks, with the sudden influx of new Novice calls, I have noticed that the Novice band on 80 metres has become cluttered and at times unusable due to QRM.

Forgetting about the QRM caused by intruders I found that most interference was being caused by full call operators running high power and having rag chew skeds amongst themselves. At the same time I have observed that the 80 metre segment 3.6-3.7 MHz has been almost unused.

Could I suggest that these full call operators QSY to the upper portion of 80 metres and make things easier for the Novices who must run low power and usually inferior antennae.

Their move will also utilise our 80 metre band allocation more effectively.

Mike Hennessy. ■

ST. GEORGE AMATEUR RADIO SOCIETY

May 12, 1977.

Dr. David Warlaw,
Federal President,
Wireless Institute of Australia.
Dear David,

At the regular monthly meeting of this Society we were informed by our WIA Liaison Officer that a general appeal for funds to assist with expenses of delegate/s to WARC 79 has now been launched.

The Committee of this Society has now fully discussed this appeal and I have been instructed to inform you that the St. George Amateur Radio Society hereby pledges the amount of $2 per member towards this important appeal. It is envisaged that the total contribution will amount to $300.

We would advise that this money is yet to be raised and will be available at your request from this Society when finalisation of your appeal draws closer.

On behalf of the Committee of Management and the members of this Society we wish you and the WARC Committee every success with planning for the forthcoming conference and it is our wish that the Amateur fraternity of Australia must be actively represented at the WARC 79 Conference.

Yours sincerely,
Allan R. Pettiford, Hon. Secretary. ■

HAMADS

- Eight lines free to all WIA members. $9 per 3 cm for non-members.
- Copy in typescript please or in block letters to P.O. Box 150, Toorak, Vic. 3142.
- Commercial advertising is excluded.

FOR SALE

Returning to UK, must sell FT101, ex cond, Pye 2m tcvr 15W; new QM70 2m/70cm compact tripler/convertor, ASAHI mobile whips 10-160m, Hygain antenna switch, SWR/wattmeter, 14 el 15 dB 2m parabeam, new Kit 2m 40W PA, 14 AVQ antenna. Ph. Andrew VK1NAM/ZDA (062) 51 1195, A.H.

Tektronix model 453, CRO with leads, approx. 5 yrs old, $1,200. Ampex model 5800 1 inch colour, editing, video tape recorder, $1,000, plus tape. Teletype machine, model 15, fully serviced, with keyboard, $60. VK2ZPM, QTHR. Ph. (02) 476 2304.

Mobile helical whips, 66 inch solid fibreglass, ½-inch taper to ¼-inch, 3/8-24 standard screw ftg. Well proven, high efficiency; adjustable tip for frequency variation. 80, 40 and 20m bands, $18 each. VK3JQ. Ph. (03) 818 8749.

AWA MR10 2m carphone, complete with Ch 40, xtals, remote control unit, AC and DC power supplies. Ideal base station, $25. VK3AFO, QTHR. Ph. (060) 24 2537.

TCA1674 hi-band transceiver converted for 2m. QQE03/20 output with spare QQE06/40 and other spare valves. Crystals and spares for Ch 40, Ch. 37 Rx only, $45. Also interested in exchanging (or selling) spare Ch. 37 and 40 crystals (D-type) for other channels (f—36 Tx (—2 MHz) —7 RX). VK3ZLM, 3/113 Gordon St., W. Coburb. Ph. (03) 386 7902 A.H.

Swan 250 with speaker and 240V power supply, $170. VK2SI, QTHR.

Drake TR4C transceiver with AC4 240V P/S (both as current units), 10-180m, SSB, AM, CW, 300W PEP input, with handbook; also complete set of new tubes and transistors to suit, no mic, $500, ONO. Used to receive only, going solid state. VK2ZWG. Ph. (069) 42 1392.

Kenwood TS520 SSB transceiver, inbuilt AC/DC supply, complete with spare American 6146B's, microphone and English instruction manual, condition as new, rarely used due absences overseas, $500. Ross Treloar VK2BPZ. Ph. (02) 239 5267, Bus.

AM TX WW2 mod. 3BZ, v. good cond., 7W 2-10 MHz xtal cont., 12V, offers. Also many bits and pieces, including many radio and TV parts, speakers, valves, etc.; also many surplus bits. K. Anderson, 8 Ida St., Hornsby, 2077, NSW

Transceiver, "Multi 7", 2m FM, with crystals in 17 channels. Rx good, transmitter faulty, with mike, manual, etc., $100. (Less than cost of crystals.) VK2CE, QTHR. Ph. (02) 871 7758.

Drake 2A Rx, 80, 40, 20, 15, 11, 10m. V. good condition, manual and power supply, $120. M. Wright RMB 619, St. Arnaud, Vic., 3478.

RTTY equipment (Creed), 6S/5m auto transmitter, 7P/N4 perforator. Both units in excellent condition, supplied with 20 rolls of tape and manufacturer's manuals, $150. VK5JE, QTHR. Ph. (08) 262 4622.

FT220 2m transceiver, very little use, just 3 years old, new condition, AC and DC powered, FM, CW and SSB modes. Reason for sale—unable to find time to use it. $400, ONO. VK3ATR, QTHR. Ph. (03) 336 1054.

Honda E300 generator, 240V AC or 12V DC, little used, as new, $200. Paint sprayer, gc., $60. VK3BBH, QTHR. Ph. (057) 59 2518.

9, 10, 11 and 15 yd lengths of 75 ohm coax, 3/8 in. dia., 12 yds 12 way colour coded cable all in one screen, ½ dia. Never been exposed to the weather. New valves, U19, 6CW4 (Nuvistors), 815, 416B. Geloso VFO 4/101, complete with dial, etc., new and unused. Pwr trans, 565-565, 250 mA, 2 x 6, 3V, 4A and 5V 4A. 575-575, 250 mA, 6.3V 4A, 5V 4A. 100W mod transformer. Large chokes and block caps. Vintage AWA car radio, working, complete with all cables. Offers to Maurie Batt, RSD, Rokewood Junction, Victoria, 3351.

Test equipment, as new: FET VOM "TMK" 150, $50. Audio sig gen "Tech" TE22D, $50. RF sig gen "Tech" TE20D, $50. Lens, "Canon" Macro FL3.5, $100. Flash gun, "Sunpak" 107 professional, with charger, $30. Screen, 6 ft sq, roll-up, with stand, /40. VK2CE, QTHR. Ph. (02) 871 7758.

Heathkit SSB txcvr, SB101 and AC psu/spkr, 80-10m plus 11m, v clean, incl mic and manuals, $320, ONO. B. Bathols VK3UV, 6 Ann Court, Aspendale, Vic. Ph. (03) 90 6424 (A.H.).

Cushcraft 6m beam in perfect condition, heavy duty, 5 el, all hardware included, $25. Ph. (03) 457 2131, Bus.

IC502, new condition, in packing, $180. Contact Barry Mews. Ph. (02) 816 1972.

Icom IC502, very little use, mint condition, $180, ONO. VK2YDY, QTHR or Ph. (067) 52 1185.

AWA high-band repeater, solid state, 12V, plus diplexer. Sell or swap for good scope, i.e. BWD 539D. VK6JJ, QTHR. Ph. (092) 37 7914.

Clegg FM27B 2m FM transceiver Continuous coverage, separate Tx and Rx frequency selection, 25W, with lockable mobile cradle, manual. Quality US gear, $250. 10A 12V adjustable regulated power supply, $45. Offers considered. VK2HS, 23 Brisbane St., Bondi Junction, NSW, 2022. Ph. (02) 387 2492.

Oscilloscope, magnificent lab quality Fairchild type 766H. Bandwidth 50 MHz. Dual trace, delayed sweep, solid state with big screen. Beautiful condition, with manuals, probes and accessories, $550. Offers considered. VK2HS, 23 Brisbane St., Bondi Junction, NSW, 2022. Ph. (02) 387 2492.

Collins KWM2 transceiver, with homebrew P/S. In excellent condition. Best offer. VK3BAJ. Ph. (03) 725 6223, A.H.

FT101B transceiver, complete with mic, CW filter, handbook, all leads, in original carton, mint condition, $550. IC215 2m FM transceiver, fitted with channels 2, 4, 6, 7, 8, 40 and 50, with mic, handbook, original carton, mint condition, $180. VK3BFS. Ph. (03) 277 3082.

Comdel speech processor, $50. VK3AIF, QTHR. Ph. (03) 857 5401.

Hewlett and Packard 25 Calculator, stock registers, 8 storage registers, 50 program memories, c/w instructions, AC power supply, book of programs, etc., $215. Ph. (03) 97 6031 or 41 2934, ask for Leon.

Hewlett and Packard 65 Calculator, fully programmable, 9 storage registers, 200 program memories (stores it on magnetic tape), c/w instructions, AC power supply and programs. Can supply programs on math 1 and 2, finance, electrical engineering 1 and 2, etc. Excellent condition. This machine does everything. Retails around $700, will accept $345, ONO. Ph. (03) 97 6031 or 41 2934, ask for Leon.

Commercial Radio Mast, four 25 ft winch-up telescoping sections. Fitting for pipe at top, $380. VK2ALX, QTHR. Ph. (02) 949 3761.

52 ohm air dielectric rigid coaxial line 1.625 in. OD, four 24 ft and three 14 ft lengths. Offer to VK3XY, QTHR. Ph. (03) 97 1265.

Yaesu Musen FL200B Tx, 10-80m, CW, AM, SSB, 240W PEP, very good condition, $210. Telescopic tower, 80 ft, four section wind-up, $120. VK2BFB. Ph. (02) 639 8367.

Kenwood TS510 5 band 180W PEP transceiver, incl power supply. As original, no mods, looks good and goes well, $300. VK3CDX, QTHR. Ph. (03) 877 1135 (except 19/8 to 3/9).

Telefunken Rx E127 kW/4 and separate antenna diversity combining unit. Rx 1.5 to 30 MHz in 5 bands with 2-speed dial, variable band-width switched for 0.1, 0.5, 1,5, 3 kHz, RIT, AGC on-off, field strength/audio meter switch, RF-AF gain, 240V mains power. Many other features and quality construction. Antenna diversity combining unit is separate unit with 17 transistors. Selects electronically from 3 antennae. Mains or battery supply. Designed for use with above Rx, but will split. Full handbooks for both. Reasonable offer, or swap with adjustment either way for good gear. VK2KR, QTHR. Ph. (02) 449 4524.

2m FM Transceivers, AWA MR6 single channel with ch 42, MR10A two channel with ch 40, both with handbooks and all accessories, new valves and operating inst. Good condition, $70 the lot. VK3ZKS, QTHR. Ph. (03) 380 6793.

At half retail or swap. All new and boxed. 6AJ8, 7360, 6146, KT66, 866A, 6DQ6A, 1629, 83, 1625, 6AU6, 6AG5, 6J6, 6BE6, 6BQ7A, 6AQ5, 12AT7, 6CB6, 6AK5, 6BJ6, 6C4, 6N8, EF86, 6M5, 6AV6, 12AV6, 6X4, 12AQ5, 12BA6, 12BE6, 85A2, 6AH6, 6AT6, 5R4GY, 6Y6, 807, 6V6, 2E26, 6AG7, 6AC7, 6BQ5, 6CA7, 6N7. VK2KR, QTHR. Ph. (02) 449 4524.

FT75 Transceiver with nine xtal freq, DC power supply FV 50c VFO. Used less than 1 hour, $350 the lot. VK3SS, 34 Henry St., Maffra, 3860.

Hall SX101 Rx, ex cond, $220. HT37 Tx, slight fault, $90. Old WR300 transceiver (similar to Drake TR3), not working, repairable, $50. Will exchange for VHF SSB equipment. W. Melrose VK3AWD, 32 Lackenheath Dr., Tullamarine, Vic., 3043. Ph. (03) 338 8574.

RTTY AFSK generator kit, designed for West Australian version of popular ST5, RTTY demodulator is incorporated inside cabinet. Generator can be used to modulate any SSB rig if required. Price is $23. Creed 7B teleprinter, very good condition, $65. Plenty of spares available, except motors, for the 7B Creeds. Please advise your requirements. VK3AQB. Ph. (03) 337 4902.

Lafayette Rx, 80m-6m, as new condition, model HA800B, complete, handbook, 12V DC/240 AC, $135. VK4ZBI, QTHR.

WANTED

3000 rpm motor to suit Creed 7B teleprinter, armatures must have straight shafts; if not electrically OK, must be capable of being rewound. VK3AQB. Ph. (03) 337-4902.

"S" Meter No. 699 for Eddystone 888A, also similar for 750 Rx. VK4ZBI, QTHR.

FT101 Transceiver, 6m and 2m, transverters suitable for same. Must be GWO, IC202 with lin, etc. W. Melrose VK3AWD, 32 Lackenheath Dr., Tullamarine, Vic., 3043. Ph. (03) 338 8574.

National NCL2000, first class condition only. Advise serial number and price. Clipsal military keys WT No. 2, complete VK3BR, 201 Spring St., Melbourne, 3000.

Borrow, rent or buy crystals for KP202 for ZL repeater channels during November. A Dixon VK7ZAJ, 54 Adelphi Rd, Claremont, Tasmania, 7011.

Yaesu FT200, unmarked, with power supply and manual. R. Cant, 94 Edgecumbe St., South Como, WA, 6152.

Whip Antenna, in sections, any length, ex army, navy, RAAF. VK8CO, Box 40441, Casuarina, NT, 5792.

FT75B or FT75, power supplies not essential, but may be considered. Price and particulars to Terry Hine VK8NTA, Box 753, Darwin, 5794. Ph. (089) 81 2769.

Hand morse key, ex RAAF or PMG. P.O. Box 334, Coolangatta, Qld., 4225.

6m Rx suitable for SWL (both home-brew and commercial units considered). Circuit diagram for hi-fi deluxe model KT1002W reel to reel recorder. Details to Graham Mutton, 85 Finlay St., Bridgewater, 7401.

B28/CR100 Rx in good unmodified condition. Price and particulars to VK6TO, 43 Strickland St., Mt. Claremont, WA, 6010.

Linear amplifier for use on 10 to 80m. Please contact VK5ADP. Ph. (08) 337 4668.

2m mobile FT221, IC22 etc. Must be good and include manual and mounting hardware, etc. VK7AR, P.O. Box 90, Devonport, Tas., 7310. Ph. (004) 24 5666.

Atlas 210X or similar physically small transceiver, like Swan monobander, in any condition, for portable and mobile use. VK4XT, QTHR, or Box 496, Dalby. Ph. (074) 62 2389.

EXCHANGE

Swap Yaesu FRDX400 Rx for FT75BS (power supply also if possible). Covers all HF amateur bands; 50-52 MHz (change xtal to cover 52-54 MHz) and 144-146 MHz, very good condition, passed NAOCP, awaiting licence. Write B. G. Roche, 103 Sig. Sqn., Lavarack Bks., Milpo, Townsville, Qld., 4813.

SILENT KEYS

It is with deep regret that we record the passing of —

Mr. W. J. ROBERTSON VK2BWL
Mr. W. L. JACKSON VK3XM
Mr. R. E CONRAD VK7TR
Mr. D. PORTHOUSE VK7DN
Mr. E. SALAMY VK3PS

VK3PS Ted Salamy of 61 Verdon Street, Warrnambool, previously VK3AJ, and prior to that held a number as an experimental licence in the very early days. He obtained his AOCP licence No. 35 on the 1st December 1924 at a cost of 2 shillings and sixpence. He passed away on the 11th of June, after a long illness. Ted was the man who pioneered radio in the City of Warrnambool in the days of 200 metres under the call sign of 3AJ. He also was the first district amateur to contact the USA in 1926.

The late Lang Osborne of Terang and Ted Salamy carried out transmission tests for the PMG. He was also a very good fist on the key, being one of the old original brass pounders as they were called. He also wrote technical articles for the local paper, the "Warrnambool Standard" under the name of "Circuit" in 1927-28-29,30, and was also responsible for many radio enthusiasts taking up positions as technicians with the PMG in the early days.

He attended clubs, Scouting groups, etc., lecturing them on the facets of radio. Ted served in the army in the signals training CW operators.

Ted is survived by a sister, Rose.

The funeral took place at the Warrnambool cemetery on Tuesday, the 14th June. Coffin bearers were radio amateurs who had known him all his life — Les Kermond, Norm Gee, Harry Duggan, Bill Wines.

Submitted by Bill Wines.

Mr. THOMAS DAVID HOGAN VK3HX

Tom Hogan VK3HX, who died suddenly on 8th June, 1977, was first licensed about 1937 when he resided at Charlton in North Central Victoria, where the family published the district newspaper. His experience in this field was of great value to the WIA when he came to Melbourne and became a member of the Magazine Committee. He is perhaps best remembered as Editor of Amateur Radio, which office he held from 1941 until 1956.

In particular, the period from March 1941 until September 1945 was an extremely difficult one. It was during this period that Amateur Radio was produced on a hand-operated duplicator and the amount of work which Tom did could only be appreciated by those who worked with him. In recognition of this service he had been made a life member of the Victorian Division. Over recent years his main activity was on 80 metres Sideband and 2 metres FM, where he continued to keep in touch with many of his old friends.

Despite a severe physical disability, Tom always maintained a keen interest in Institute affairs. His sense of humour and cheery smile will be remembered by many "old-timers" and he will be greatly missed by all who knew him.

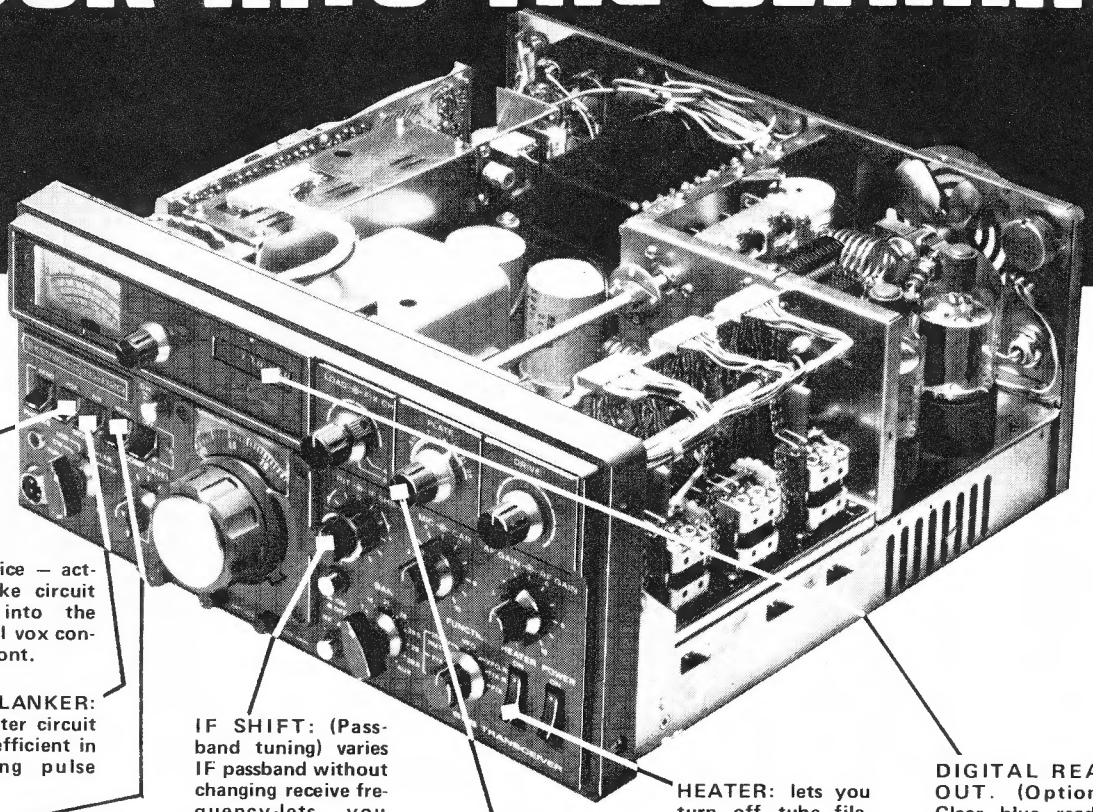
From Jim Marsland VK3NY.

Mr. BILL ROBERSTON VK2BWL

Friends of William Joseph (Bill) Robertson (VK2BWL) will be saddened to learn of his passing on 1st June last in Coffs Harbour. Bill will be particularly remembered when he was active from Coopers Plains and later Charleville, with the call VK4WL, during his employment with the Department of Civil Aviation. He passed away after a short illness, having retired only a few months previously. To Val, his XYL, and family go our deepest sympathies.

VK4ZGL.

LOOK INTO THE ULTIMATE



VOX: Voice – activated mike circuit is built into the TS820. All vox controls up front.

NOISE BLANKER: Crystal filter circuit is highly efficient in eliminating pulse noises.

RF MONITOR: lets you hear your own transmission. Also useful for adjusting RF processor

IF SHIFT: (Passband tuning) varies IF passband without changing receive frequency-lets you eliminate unwanted signals. RIT lets you vary receive frequency 5k Hz either side of VFO.

VERNIER: Plate tuning control has vernier for fast precise tune-up adjustment.

HEATER: lets you turn off tube filaments on receive only. TS820's solid state circuit draws less than most car dash lights.

DIGITAL READ-OUT. (Optional) Clear blue readout on receive and transmit. Mixes carrier, VFO and 1st het frequencies.

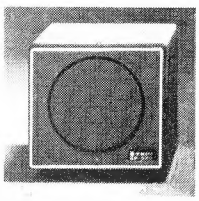
THE BREATHTAKING KENWOOD TS-820 PACESETTER HF TRANSCEIVER

You command the band with our Kenwood TS820. Superb phase lock loop circuitry allows highly accurate frequency derivation without introducing spurious signals. You can switch sidebands (USB, LSB, CW) without recalibrating, too!

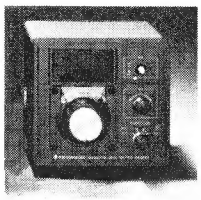
Kenwood's exclusive FET-based VFO gives high stability under all conditions. If you'd like to know more, just mail the coupon today.

WHEN YOU WANT TO MOVE UP:

TV506: 6MTR band transverter



SP-520: 80hm external speaker



VFO820: Remote VFO 5.0 – 5.5 MHz

TV502: 2MTR band transverter

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AUGUST 1977
Vol. 45, No. 8

ELECTRONIC ENTHUSIASTS EMPORIUM

POPULAR INTEGRATED CIRCUITS IN STOCK

CA3012	4.60	CD4026	3.30	CD4724	3.85	LM380N	2.75	MC1496K	2.75	UAA180	3.25
CA3013	5.80	CD4027	1.05	CD40097	1.80	LM381N	3.20	MC1590G	6.75	UA723C	LM723
CA3018	3.50	CD4028	1.80	CD40098	1.80	LM382N	2.60	MC14553	12.50	UA757	3.80
CA3023	6.80	CD4029	2.65	CD40174	2.90	LM387N	2.75	MC1648P	4.90	ULN2208	2.45
CA3028A	2.60	CD4030	.95	CD40175	2.90	LM395K	6.90	MC4044P	4.90	ULN2209	2.45
CA3035	5.20	CD4031	4.70	CD40192	2.90	LM555CN	1.20	OM802	3.20	ULN2111	2.10
CA3039	2.10	CD4035	2.35	CD40194	2.90	LM555H	1.95	SAJ110	2.50	74C00	.55
CA3046	LM3046	CD4040	2.50	CD40195	2.90	LM556N	2.95	SAK140	2.50	74C02	.80
CA3053	1.70	CD4041	2.50	DM8097	1.90	LM562B	10.90	SD305DE	1.30	74C04	.55
CA3059	8.40	CD4042	1.95	HEF see	"CD"	LM565N	3.50	SD306DE	1.50	74C10	.65
CA3060	8.40	CD4043	2.25	LH0070	6.20	LM566CN	2.50	SL415A	2.70	74C14	2.80
CA3079	4.40	CD4044	2.25	LM114H	4.90	LM567CN	3.50	SD425A	1.80	74C20	.75
CA3080	2.10	CD4045	3.20	LM301AN	.95	LM709N	.95	SL437D	3.60	74C85	3.90
CA3081	2.70	CD4046	3.20	LM301CN	.95	LM710CN	1.25	SL440	1.90	74C86	2.00
CA3082	2.70	CD4047	1.95	LM304H	3.80	LM710CH		SL442	2.90	74C90	2.50
CA3083	2.90	CD4049	.90	LM305AH	3.80	LM723H	1.70	SL447	4.90	74C154	5.70
CA3086	LM3086	CD4050	.90	LM307N	1.60	LM723N	1.25	SL449	1.60	74C160	3.60
CA3089E	2.90	CD4051	2.25	LM308V	2.20	LM725N	5.90	SL610C	7.25	74C162	4.50
CA30900	6.90	CD4052	2.25	LM309K	2.60	LM733CH	2.70	SL612C	7.25	74C174	2.50
CA3091	18.00	CD4053	2.25	LM310N	3.90	LM733N	2.50	SL613C	12.50	74C192	2.80
CA3120E	4.50	CD4066	1.45	LM311A	3.60	LM741CH	1.20	SL620C	9.50	74C901	1.95
CA3127E	4.50	CD4068	.55	LM311H	3.60	LM741CN	.75	SL621C	9.50	74C925	16.70
CA3128E	9.90	CD4069	.60	LM312H	4.90	LM747CH	2.70	SL623C	17.40	80C95	2.20
CA3130T	2.25	CD4070	.55	LM317K	6.90	LM747CN	2.50	SL622C	26.90	**MISC**	
CA3140T	2.25	CD4071	.55	LM318N	5.90	LM748CN	1.20	SL624C	8.80	AL5352	1.50
CA3600	3.30	CD4072	.55	LM319H	7.25	LM1303N	2.60	SL630C	6.90	GL4484	1.80
CD4000	.55	CD4075	.55	LM319N	5.90	LM1310N	3.50	SL640C	10.60	GL5253	.90
CD4001	.55	CD4076	1.25	LM320K	6.90	LM1458N	2.50	SL641C	10.60	OL31	.90
CD4002	.55	CD4078	.55	LM320T	4.50	LM1488N	6.90	SL645C	12.60	RL4484	.39
CD4006	2.30	CD4081	.55	LM322N	4.50	LM1489N	5.75	SL901B	3.90	RL5023	.35
CD4007	.55	CD4082	.55	LM323K	7.90	LM1496N	1.90	SL917B	6.50	FND357	3.50
CD4008	2.35	CD4085	1.65	LM324N	4.50	LM1808N	3.90	SL1310	1.60	FND500	3.50
CD4009	1.50	CD4086	1.65	LM325N	4.50	LM3028	CA3028	SL3046	1.20	9001	1.80
CD4010	1.50	CD4093	1.80	LM326H	4.50	LM3046	3.60	SP8505	8.60	9368	3.85
CD4011	.55	CD4502	2.70	LM339N	3.70	LM3086	3.75	SP8515	12.90	9601	2.90
CD4012	.55	CD4503	1.40	LM340K	4.95	LM3900	1.75	TAA300	2.90	NSN71	2.90
CD4013	.90	CD4510	3.20	LM340T	2.70	LM3905	3.90	TBA570	2.90	NSN74	2.90
CD4014	2.40	CD4511	3.30	LM349N	4.50	LM3909	1.50	TBA700	4.90	TIL306A	
CD4015	2.40	CD4514	6.50	LM358N	3.20	MC1035P	2.90	TBA810A	4.90	11C90	18.50
CD4016	.90	CD4515	6.50	LM370H	4.95	MC1312P	4.80	TB1750A	3.90	95H90	14.50
CD4017	2.25	CD4516	3.20	LM371N	3.90	MC1314P	6.90	TCA220	2.25	2102-2	3.75
CD4018	2.25	CD4518	2.85	LM372H	7.50	MC1315P	10.75	TCA290A	4.90	2513N	17.50
CD4019	2.25	CD4519	1.35	LM372N	4.50	MC1350P	1.95	TCA420A	4.90	S1883	
CD4020	2.50	CD4520	2.55	LM373N	4.70	MC1351P	3.60	TCA580	6.50	S50242	15.00
CD4021	2.25	CD4528	1.80	LM374N	4.90	MC1454G	5.40	TCA730	6.90	MA1002	13.50
CD4022	2.15	CD4539	1.98	LM375N	4.90	MC1458	LM1458	TCA740	6.80	7805CP	2.90
CD4023	.55	CD4555	1.80	LM377N	3.50	MC1468L	6.50	TDA1005	5.50	7824CP	
CD4024	1.75	CD4556	1.80	LM379	7.50	MC1488	LM1488	UAA170	3.25		
CD4025	.55	CD4720	12.60								

In some cases pin for pin substitutes will be supplied.

POPULAR SEMI-CONDUCTORS STOCKED

7400	.48	7483	2.30	74S258	4.75	74LS174	2.70	BD238	1.80	2N3566	.95
7401	.48	7485	2.95	74S196	7.50	74LS175	2.70	BD437	2.80	2N3568	.95
7402	.48	7486	.85	82S23	6.95	74LS181	6.50	BD438	2.80	2N3569	.50
7403	.48	7489	4.50	8281A	3.90	74LS191	4.50	BF173	1.25	2N3638	.55
7404	.48	7490	.90	82S90	7.50	74LS192	4.50	BF180	1.20	2N3638A	.60
7405	.48	7491	1.90	74LS00	.55	74LS193	4.50	BF194	.85	2N3642	.55
7406	1.09	7492	1.20	74LS01	.55	74LS194	2.60	BF200	1.30	2N3643	.55
7407	1.09	7493	1.20	74LS02	.55	74LS195	2.60	BFY50	1.20	2N3694	.65
7408	1.09	7494	2.20	74LS03	.55	74LS196	2.60	BFY51	1.50	2N3731	5.95
7409	.48	7495	1.65	74LS04	.65	74LS221	2.50	BPX25	4.90	2N3819	1.35
7410	.48	7496	2.15	74LS08	.55	74LS253	2.75	BSX19	.75	2N3866	2.75
7411	.54	74100	3.65	74LS09	.55	**SEMICONDS**		BU126	3.85	2N4037	1.25
7413	1.15	74107	.95	74LS10	.60	AC125	1.80	MFE131	1.95	2N4249	.65
7414	2.70	74121	1.20	74LS11	.55	AC126	1.80	MJ802	8.90	2N4250	.65
7416	1.00	74122	1.20	74LS13	1.20	AC127	1.80	MJ2955	2.60	2N4355	.65
7417	1.15	74123	1.40	74LS14	2.95	AC128	1.80	MJ4502	8.90	2N4356	.65
7420	.48	74132	1.90	74LS20	.55	AC132	1.50	MPF102	.65	2N4360	.95
7422	1.95	74141	2.75	74LS21	.55	AC187	1.50	MPF103	.85	2N5245	.75
7425	.95	74145	2.95	74LS22		AC188	1.50	MPF104	1.10	2N5457	MPF103
7426	.70	74150	3.25	74LS27	.60	AD149	2.60	MPF105	.65	2N5458	MPF104
7427	.66	74151	2.20	74LS28	.60	AD161/62	4.50	MPF106	1.15	2N5459	MPF105
7430	.48	74153	1.95	74LS30	.55	AS322	.18	MPF121	1.60	2N5485	MPF106
7432	.66	74154	3.20	74LS32	.70	AT1138	2N301	MPF603	6.90	2N5590	MPF603
7437	.90	74157	2.20	74LS37	.70	ASY17	2.65	TIP31C	1.20	2N5591	11.30
7438	.90	74160	2.75	74LS38	.70	BC107	.35	TIP32C	1.30	2N6027	1.35
7440	.48	74164	2.90	74LS40	.65	BC108	.35	TIP120	3.20	2N6084	21.00
7441	2.80	74165	2.90	74LS42	2.20	BC109	.35	TIP125	3.30	BA102	.80
7442	2.60	74174	2.90	74LS73	.75	BC177	.40	TIP141	4.70	OA47	.60
7445	2.60	74180	2.90	74LS74	.90	BC178	.40	TIP2955	1.70	OA90	.35
7446	2.60	74181	5.95	74LS75	1.20	BC179	.40	TIP3055	1.70	OA91	.35
7447	2.60	74185	4.90	74LS78	.75	BC182	.40	TT800	2N4037	5082-2800	3.20
7448	2.60	74190	3.20	74LS86	.95	BC212	.50	TT801	1.20	40440	2N3731
7450	.48	74177	2.90	74LS90	1.95	BC327	.55	2N301	2N2869	40637A	2.85
7451	.48	74191	2.90	74LS92	1.95	BC337	.55	2N706A	1.20	40673	1.95
7453	.48	74192	2.75	74LS93	1.95	BC547	.55	2N918	1.60	40822	2.90
7454	.48	74193	2.75	74LS95	2.60	BC548	.55	2N2222A	1.20	40841	1.90
7460	.48	74194	2.50	74LS109	.85	BC549C	.55	2N2646	2.50	BZX61	.75
7470	.85	74195	1.90	74LS113	.85	BC559	.55	2N2869	2.70	BZX79	.42
7472	.75	74196	2.90	74LS114	.85	BC639	1.20	2N2904A	1.50	BZX70	1.50
7473	.80	74S00	1.50	74LS151	2.60	BC640	1.20	2N2905	1.20	BZY93	2.60
7474	.95	74S10	1.75	74LS153		BD131	1.20	2N3053	1.20	BZY91	12.50
7475	1.35	74S20	1.75	74LS157	2.40	BD132	1.60	2N3054	1.70	PA40	5.85
7476	.90	74S74	3.50	74LS163	3.95	BD139	1.20	2N3055	1.35	PB60	6.50
7480	1.60	74S112	3.20	74LS163	3.95	BD140	1.20	2N3564	.65	MEL12	1.40
7482	2.30	74S251	5.30	75LS164	2.90	BD237	1.80	2N3565	.55	FCD820	1.90

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12" x 12" D.S.	6.00
6M CONVERT	2.50
2M CONVERT	2.50

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8 PIN	.45
14 PIN	.48
16 PIN	.54
24 PIN	.95
40 PIN	1.50

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T-12	.70
T-25	.7[illegible]
T-37	.8[illegible]
T-50	.85
T-68	.95
T-80	1.10
T-94	1.50

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5200/8PLB	.25
7300CAN	.25
F16 or F29	.12

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PL259	1.95
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BNC Sockets	1.60
7 Seg Displays	2.50
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216 x 108 x 50	3.75
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7360	P.O.A.
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*6146	8.90
*6146B	9.70
*6939	16.95
*4-125A	63.90
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*6JS6	P.O.A.

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